Feb. 15, 1949. R. H. WHITEHEAD 2,461,793

RELEASING MECHANISM FOR TIME FUSES

Filed July 11, 1939

Fig. 1.

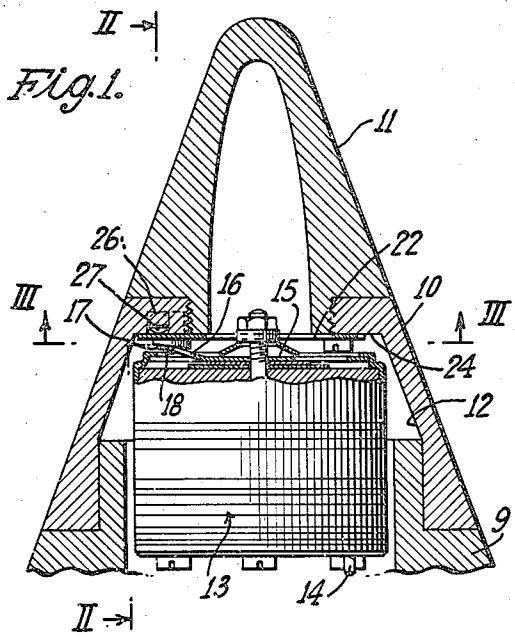



Fig. 2.

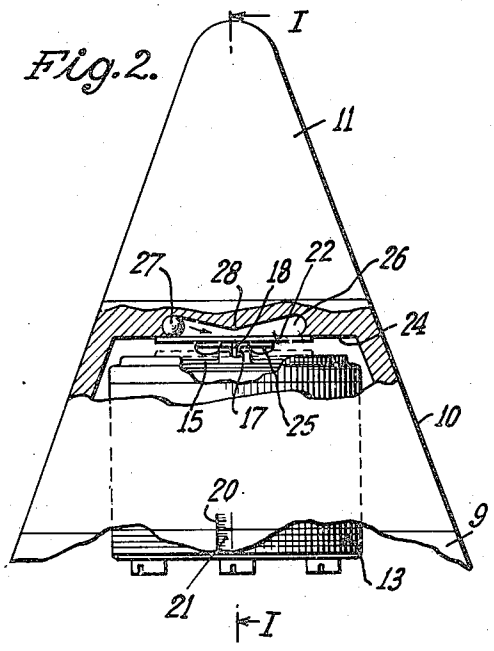



Fig. 3.

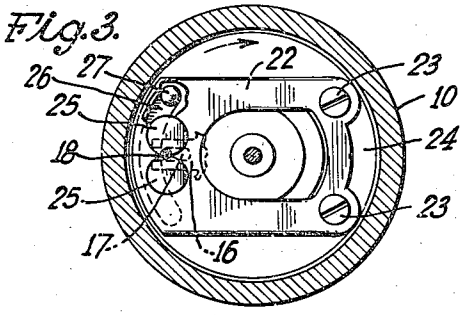



Fig. 4.

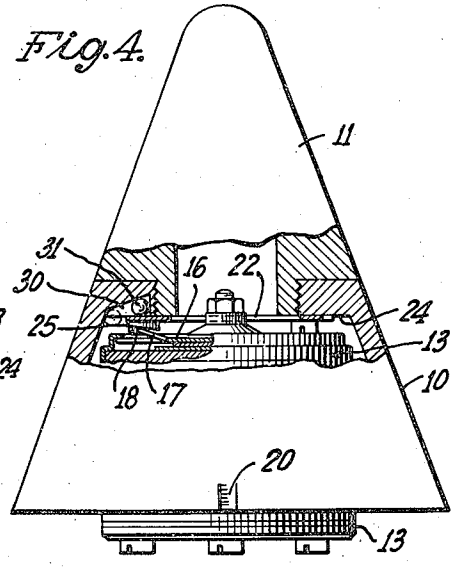



Fig. 5.

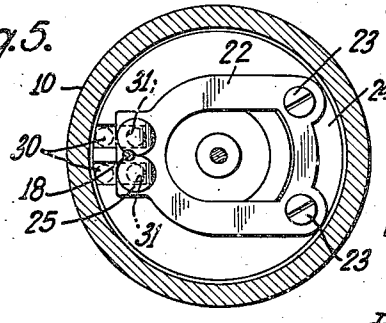



Fig. 6.

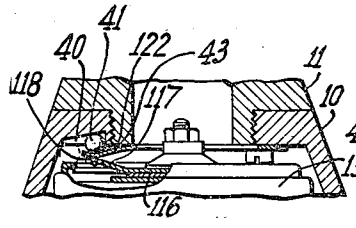
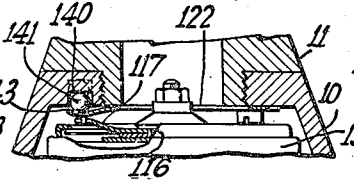



Fig. 7.




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## RELEASING MECHANISM FOR TIME FUSES

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3 Claims. (Cl. 102—83)

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This invention relates to a releasing mechanism for time fuses.

These fuses generally comprise a timing mechanism and a firing pin so connected that the firing pin will be discharged a predetermined length of time after the projectile leaves the gun. To determine the predetermined length of time there is contained within the fuse a settable member commonly in the form of a disc connected to some external portion of the fuse, for example the nose of the fuse, in such a manner that the mechanical rotation of the nose of the fuse will rotate the disc for setting purposes and the timing element is so designed that once the time train has started in motion it will rotate the disc for a predetermined amount, depending upon the setting, before releasing the firing pin. The mechanism, therefore, involves two elements, namely the rotatable cap or nose and the rotatable disc and during the setting operation the nose and disc are in cooperative relation. During the firing operation it is desirable that the nose and disc shall be disconnected so that the time train will not have to drag the nose with it as it moves the disc.

This has heretofore involved some connection between the nose and the disc which will remain in engagement up to and including the time when the projectile is fired from the gun and which will be released at the time the projectile is fired to permit the time train itself to take up the movement of the disc without moving the nose.

A common form of such connection has comprised a lug bent upwardly from the disc in position to engage a pin upon the nose and a hammer mechanism arranged to pound the lug down out of engagement with the pin as soon as the shell is subjected to the violent forces resultant from the firing of the propulsive charge. Little is known, however, of what actually goes on inside the barrel of the gun during the minute fraction of a second while the propulsive charge is being burned. Practical experience, however, leads to the conclusion that this factor is variable, at least in some respect, since the hammer blow delivered to the lug is sometimes sufficient to bend it out of the way of the controlling pin and sometimes it is insufficient, notwithstanding the fact that the projectiles appear to be aqually influenced by the charge.

It is an object of this invention to provide a new and improved mechanism for insuring the disconnection between the rotatable nose and the timing disc to permit the starting of the time train at the time the projectile leaves the gun and

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thereby insure that no shells will be duds because of failure in this respect.

The invention accordingly comprises an article of manufacture possessing the features, properties, and the relation of elements which will be exemplified in the article hereinafter described and the scope of the application of which will be indicated in the claims.

For a fuller understanding of the nature and objects of the invention, reference should be had to the following detailed description, taken in connection with the accompanying drawing, in which:

Fig. 1 is a side elevation partly in section of a time fuse embodying this invention, the section being taken along the line 1—1 of Fig. 2.

Fig. 2 is a similar view being partially sectioned on the line 2—2 of Fig. 1.

Fig. 3 is a section on the line 3—3 of Fig. 1 with the unseen fork for the latching pin superimposed upon the view in dotted lines to show its contour and its relationship to the pin.

Fig. 4 is a side elevation partly in section of a modfication of the device.

Fig. 5 is a bottom plan view of the construction of Fig. 4, with a fuse mechanism removed.

Figs. 6 and 7 are fragmentary sectional views showing modifications of the device.

In the drawings the numeral 9 designates a conical portion of the fuse having a rotable conical element 10 mounted thereon terminating in a pointed top 11. The rotatable element 10 has a recess 12 within which there is fitted a time fuse 13. The general construction of the time fuse is irrelevant to this invention save that it contains some form of a timing mechanism adapted to release a firing pin 14 after predetermined movement of the timing mechanism and that the length of this predetermined time is determined by the setting of a disc 15 rotatable about the axis of the fuse. The disc 15 has an upstanding fork 16 having a slot 17 and the body rotatable element 10 has a pin 18 extending downwardly within the slot 17.

The fuse 13 is held rigidly upon the body 9 and the pin 18 and slots 17 are so arranged that on rotation of the rotatable element 10 the disc 15 is turned relative to the fuse to alter the setting thereof. The rotatable element 10 and the base 9 will be provided with corresponding graduations 20—21 so that the setting of the fuse may be readily determined.

The means provided within the rotatable element 10 for freeing the slot 17 from the pin 18 comprises a spring element 22 held by screws 23

on the underside of a face 24 of the rotatable element 10 and carrying at the diametrically opposite side a pair of weight 25 of such weight and so disposed that when the fuse is subjected to the jar of the propulsive charge the weights 25 will bear down against the lug 16 and bend the same downwardly out of the path of the pin 18.

This is the common construction of fuses of this character. Experience, however, has shown that on some occasions the lug 16 is bent downwardly satisfactorily and the fuse detonates after the predetermined lapse of time. In other cases, however, the hammer blow of the weights 25 is insufficient to accomplish this purpose.

It is an object of this invention to provide a mechanism which will insure that the lug 16 shall be completely depressed and held out of the path of the pin 17.

In the form of the invention embodied in Figures 1, 2 and 3 the mechanism is provided for doing this, operable by the rotational inertia and acceleration forces to which the projectile is subjected and in Figures 4 and 5 there is illustrated an alternative construction operable by the centrifugal factors.

Referring now to Figs. 1, 2 and 3, as will be seen, particularly from Figure 2, there is cut within the under face 24 of the rotatable member 10 a recess 26 adapted to receive a ball 27. This recess is disposed circumferentially and has its upper surface inclined downwardly toward one point as shown at 28.

These projectiles are brought to a tremendous rotational speed during the slight fraction of a second while the projectile is within the bore of the gun and may attain speeds in the neighborhood of 12,000 to 24,000 revolutions per minute within a period which may be less than .01 of a second. This results in a very great rotational accelerating force and the construction and arrangement of the ball 27 and of the recess 26 are such that during this excessive rotational acceleration the ball 27 is moved circumferentially within the recess 26, passing, in its progress, the point 28 at that point depressing the spring element 22 downwardly to press the lug 16 out of contract with the pin 17 far enough to completely free the pin.

The ball 27 will normally be at that end of the recess 26 in the direction of rotation of the shell so that as the shell is rotated it tends to leave the ball behind and thereby moves it along the pathway.

In the form of the invention disclosed in Figs. 4 and 5 a recess 30 is provided within the under face 24 extending in a radial direction and having an upper inclined surface and within that recess is provided a ball 31, the parts being so constructed and arranged that the ball is normally held within its inner position as shown in Fig. 4, but when the projectile is subjected to the very great centrifugal forces which are operative when it attains its normal speed the ball is thrown outwardly insuring the depression of the spring 22 sufficient to bend down the lug to free the pin. Normally two such recesses 30 may be provided as shown in Fig. 5 and two such balls 31. One such recess and ball being on each side of the setting pin 17.

With either of the foregoing construction it will be clear that the motion of the shell within the gun will positively force down the lug far enough so that even when the lug bends part way back due to its own spring action it will not come back far enough to re-engage the pin.



The form of the invention disclosed in Fig. 6 is so designed that the cap and setting disc are held in engagement by a ball which is released by centrifugal force. In this view there is provided in the rotatable member 10 a radially disposed groove 40 adapted to receive a ball 41. The spring finger 122 has a pin 118 adapted to engage the lug 117 upon the disc 116. These parts in general being similar to the parts 22, 16, 17 and 18, except that the spring finger 122 is normally biased to spring away from the lug 117 to free the parts from engagement but this spring 122 has a slight depression 43 adapted to be engaged by the ball 41 to hold the spring with the pin in engagement with the lug.

With this construction it will be clear that so long as the ball is in the position shown in the drawing, the spring 122 will connect the rotatable nose with the setting disc to permit the instrument to be set but as soon as the shell is subjected to the rotative forces the ball 41 is thrown outwardly permitting the spring finger 122 to disengage the lug.

In both of these structures of Figures 1 to 5 it will be seen that the spring element 22 is illustrated as carrying weights 25 for the purpose of bending the lug 16 downwardly due to the set back of the fuse at the time of firing and when such lugs are used it will be clear that the force of the weights 25 acting as a hammer cooperate with the balls 27 or 31 to force the lug 16 downwardly. Where such a construction is used an added factor of safety is provided in insuring that the elements will be disconnected.

It will be noted, moreover, that whereas I have shown the ball influenced by the inertia under acceleration as in Figures 1, 2 and 3 and by centrifugal, as shown in Figures 4 and 5, nevertheless by inclining the slot rearwardly as well as outwardly these two factors may both be brought to bear.

It will be understood that whereas the set back occurs principally at the time of firing and the rotational forces come into play only after the shell has started to move, nevertheless the lengths of time embodied are so small that these forces may in practical effect operate together.

The form of the invention shown in Fig. 7 is similar to that shown in Fig. 6 except that the groove 140 instead of being radially disposed is circumferentially disposed and the ball 141 is so arranged that at one position within the groove it will hold the spring finger 122 in engagement with the lug 117 but the groove will extend circumferentially away from this position contrary to the direction of rotation of the shell so that as the shell is brought into rotation the accelerating force coupled with the inertia of the ball will move the ball circumferentially to free the lug as previously described.

I have described this invention specifically as employing a ball as the element to be released by the rotational forces but it will be understood that this is for convenience of illustration and any type of element mounted to be released by these rotational forces could come within the broad scope of the invention and the word "ball" as used herein is intended to be a generic term applicable to elements actuated by any such forces.

With any of these modifications it will be clear that the rotatable nose will be held in setting engagement with the disc at all times until it is started in motion by reason of the fact that the ball prevents the movement of the

spring pin. As soon, however, as the motion starts the ball is thrown out of the way either by centrifugal action or by rotational acceleration.

With either of these modifications it will be seen that the ball in its initial or setting position is carried in a pocket to resist displacement but that the set back forces at the time the shell is fired relieve the ball from engagement with the nose because of the ball's own inertia and hence leave the ball free to fly out of the pocket due to the rotational forces.

Since certain changes may be made in the above construction and different embodiments of the invention could be made without departing from the scope thereof, it is intended that all matter contained in the above description or shown in the accompanying drawing shall be interpreted as illustrative and not in a limiting sense.

It is also to be understood that the following claims are intended to cover all of the generic and specific features of the invention herein described, and all statements of the scope of the invention which, as a matter of language, might be said to fall therebetween.

Having described my invention, what I claim as new and desire to secure by Letters Patent is:

1. In a time fuse comprising a time train within a rotatable nose, a pin extending downwardly from said nose, a timing disc, and a lug extending upwardly from said timing disc and having fingers defining a slot into which said pin



extends to lock together said rotatable nose and said timing disc, a releasing mechanism comprising in combination a substantially flat spring element spaced apart from said timing disc, one end of said spring element being secured to said nose, weights attached to the other end of said spring element adjacent to said fingers, a recess in said nose having a downwardly inclined upper surface, and a ball in said recess adapted to be moved in the recess in response to rotational forces to depress said spring element and to thereby disengage said pin from said fingers.

2. The device of claim 1 wherein the recess is circumferential, and the ball is moved in the recess by inertia.

3. The device of claim 1 wherein the recess is radial, and the ball is moved in the recess by centrifugal force.

RICHARD H. WHITEHEAD.


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