

Aug. 3, 1943.

F. DELAY

2,325,749

TIME FUSE FOR PROJECTILES

Filed Feb. 26, 1940

4 Sheets-Sheet 1

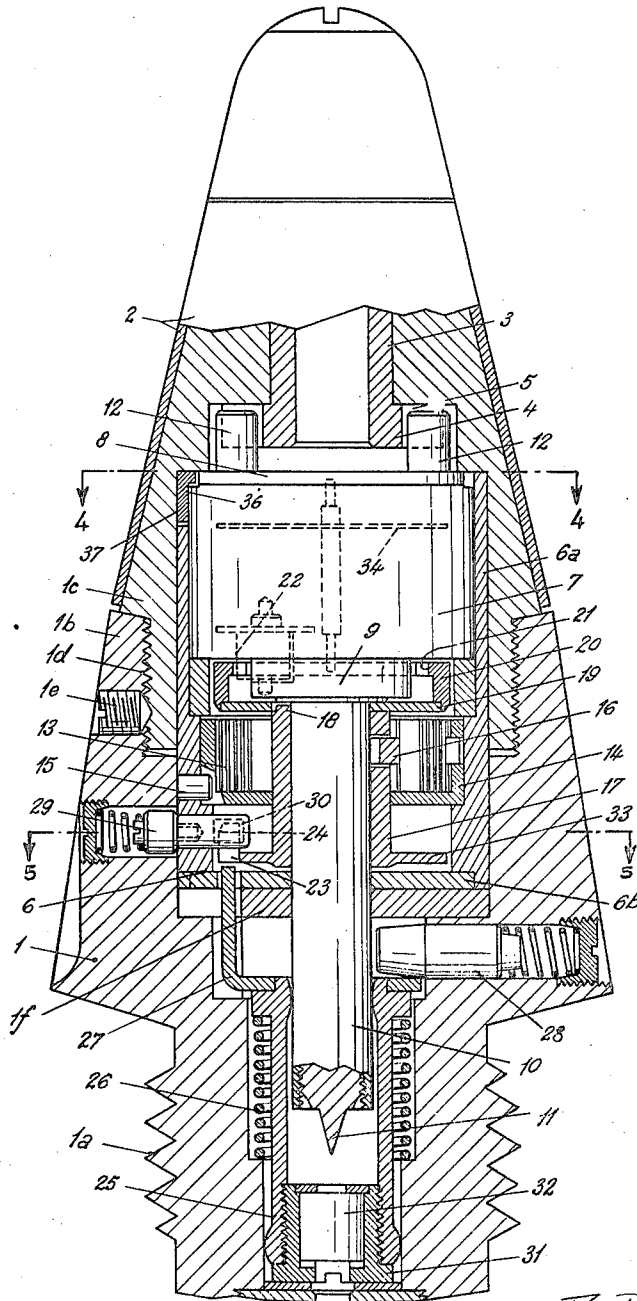


FIG. 1

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TIME FUSE FOR PROJECTILES

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4 Sheets-Sheet 2

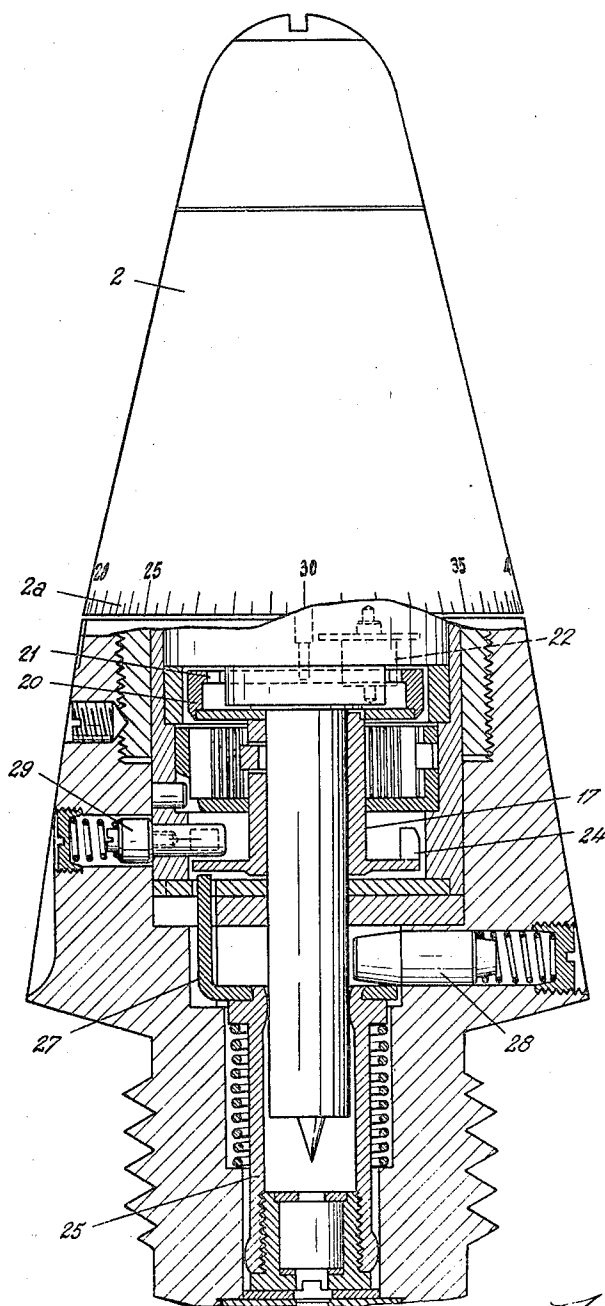


FIG. 2

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4 Sheets-Sheet 3

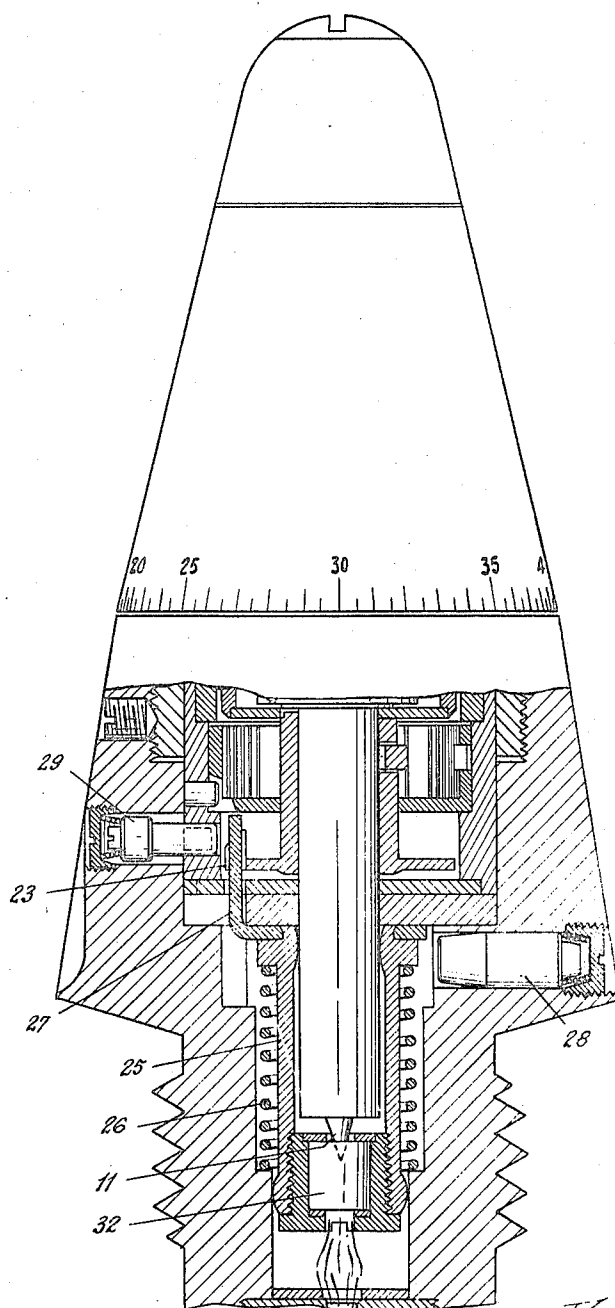


FIG. 3

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TIME FUSE FOR PROJECTILES

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4 Sheets-Sheet 4

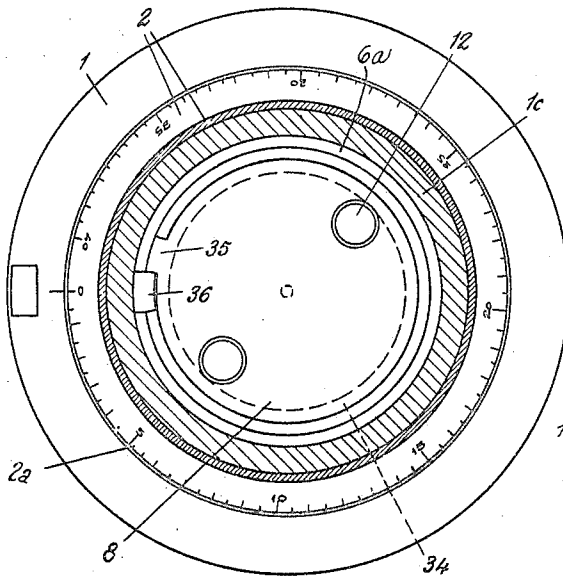


FIG. 4

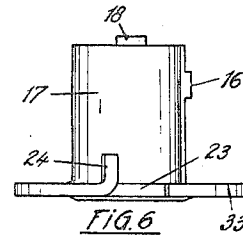


FIG. 6

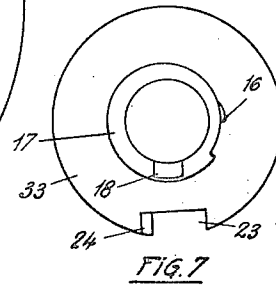


FIG. 7

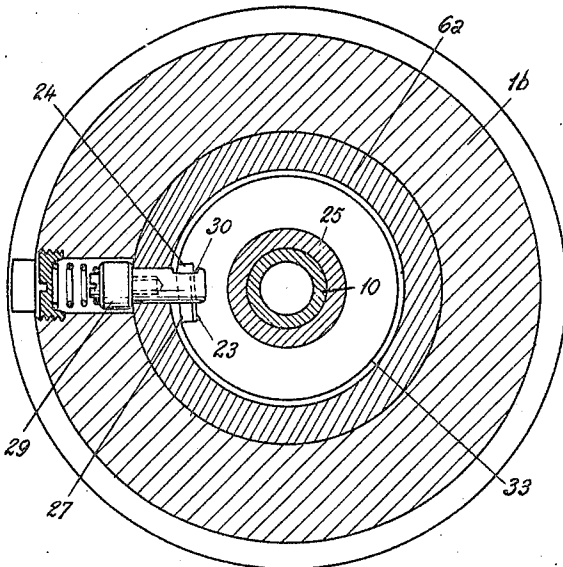


FIG. 5

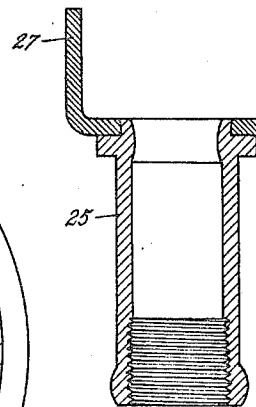


FIG. 8

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UNITED STATES PATENT OFFICE

2,325,749

TIME FUSE FOR PROJECTILES

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Application February 26, 1940, Serial No. 320,911
In Switzerland August 18, 1939

3 Claims. (Cl. 102—84)

The present invention relates to a time-fuse for rotational projectiles of the spring driven clockwork type in which the regulation of the time of ignition takes place simultaneously with the winding of the driving spring and wherein self rotation of the clockwork is arrested by centrifugal means so long as the projectile is not fired off.

In known time-fuses of this type, the following arrangement is found: The driving spring is wound on a barrel shaft pivotally supported in two bearings provided, on the one side, by a part of the clock work called the movable frame and, on the other side, by a part of said work called the fixed frame. This arrangement complicates the manufacture and, besides, presents a considerable disadvantage due to the tolerances of manufacture susceptible to provoking a faulty alignment of the two bearings in question.

Other time fuses of the common type comprise a bung mounted to rotate upon a fixed axle rigid with the body part of the fuse. Such arrangements are liable to the same inconveniences in consequence of the clearance allotted to the tolerance of manufacture. The said constructions are apt to cause a faulty alignment with respect to the clock work because the organ transmitting the driving force and consisting of an external or internal gear wheel is made integral with the barrel shaft or with the bung of the driving spring.

Another disadvantage inherent to almost every time-fuse of the cited type resides in the fact that the movable frame of the clock work, upon rotation of which the setting-up of the ignition time and, simultaneously, the winding-up of the driving spring take place, affords no stop for limiting the reciprocating angular displacements on both sides of the neutral or zero position. Owing to this deficiency, the clock works are often subjected to irremediable deterioration which occur, for instance, in the case of faulty manipulation during assembling in the work shop and, in particular, before introducing the clock work into the body part of the fuse. As generally used, the clock work may be indirectly protected against injury after its assembling with the body part of the fuse by reason of stops or like means provided for this purpose on said body part, but owing to the mentioned tolerances of manufacture, such means can not give a guarantee of efficient protection even after assembling of the said work with the fuse.

The object of the present invention is to sim-

plify the construction of time-fuses and to avoid the above cited inconveniences.

According to the invention, the time-fuse comprises in combination a hollow fuse body threaded to the projectile, a cap turnable on said body and carrying a winding key, a case fixedly mounted in said body, an axial frame carrying the clockwork, said frame being rotatably mounted in said case and engaged by said key so as to entrain the arrested clockwork in a rotatory movement about the axis of the projectile upon turning said cap, an axially disposed central guide shaft formed integral with said frame and terminating in a percussion point, an annular barrel surrounding said shaft and housing the driving spring, said barrel being secured to said case and having attached thereto one end of the driving spring, a spring pressed primer slidable on said shaft towards said percussion point, means actuable by centrifugal force for normally holding said primer away from said percussion point, a bung for the driving spring rotatably mounted on said shaft and having fixed thereto the other end of said spring, said bung being, on the one hand, connected to said clockwork for effecting simultaneously the winding of said spring and the regulation of the ignition time by means of said turnable cap, winding key and rotatable frame and for driving afterwards said clockwork under the action of the driving force stored in said spring when said work has been released for self rotation to control the angular displacement of said bung during the flight of the projectile, said bung being also adapted to cooperate with the primer to allow a sudden advancing of said primer towards the percussion point during self rotation of the clockwork, and means on the case and frame, respectively, for limiting the angular displacement of the frame, in either direction thereby protecting the clockwork against deterioration during assembling of the fuse.

Further objects and advantages of the improved construction will be apparent from the following description, reference being had to the accompanying drawings which illustrate, by way of example, one embodiment of the invention.

Figure 1 is an axial section showing the time-fuse in its position of rest.

Figure 2 is an axial section showing the time-fuse in the position after the setting-up of the ignition time, and Figure 3 is a similar section showing said fuse ready for explosion.

Figures 4 and 5 are sections taken along the lines 4—4 and 5—5 of Figure 1:

Figure 6 is an elevation and Figure 7 is a plan view of a detail.

Figure 8 is an axial section of another detail.

Referring in detail to the drawings, 1 represents the body of a time-fuse having a screw thread 1a by means of which it may be secured to the projectile not represented. Said body is constructed of two portions 1b and 1c which are united at their inner ends by means of a screw thread 1d and a screw 1e. The body 1 carries on its top a cap 2 mounted to rotate thereon and having a graduation 2a displaceable in relation to a reference mark provided on said body. The cap 2 presents also a winding key 3 the lower end of which affords a shoulder 4 having two slots 5 disposed diametrically opposite each other.

Within the body 1 is fixedly mounted a case 6 constructed of a cylindrical socket 6a and a mounting plate 6b rigid with said socket and resting on a mounting plate 1f of the body 1. The said case houses a rotatable frame of the clock work, which frame includes a block 7 having fixed thereon an upper mounting plate 8, a disk 9 and a shaft 10 forming at its free end the percussion point 11. To the mounting plate 8 are fixed two fingers 12 engaging the slots 5 of the above mentioned winding key.

13 represents a driving spring located in a barrel 14 which may be prevented from rotating by a finger 15 of the case 6. The said spring is fixed at one end to the barrel drum and at the other end to a hook 16 of a bung 17 (see Figures 6 and 7) rotatably mounted on the shaft 10. Said bung presents at its upper end a projection 18 engaging a slot provided in a plate 19 which thus partakes of the rotation of the bung. The plate 19 is secured to a socket 20 forming an internal gear wheel 21 meshing with a pinion 22 of a clock work, said pinion being pivoted on the one side in the block 7 and on the other side in the disk 9. On the upper end of the wheelwork is mounted a regulating balance wheel 34 which is held stationary by means of lock bolts not represented, said bolts being displaceable under the influence of centrifugal force.

The lower end of the bung 17 affords a plate 33 having a slot 23 which may be obtained by upsetting a piece of material forming a beak 24.

25 represents a priming holder slidable along the shaft 10 and subjected to the action of a spring 26 bearing against the body 1 and tending to shift said priming holder upwards. The upper extremity of the priming holder affords a tail 27 and the lower extremity thereof carries a hollow plug or percussion cap 31 adapted to receive the priming 32 stored therein. Said priming holder cooperates with two radial lock bolts 28 subjected to the action of centrifugal force, one of said bolts being represented in the Figures 1 to 3. Also the plate 33 of the bung 17 cooperates with a radial lock bolt 29 responsive to centrifugal force.

Figure 1 shows the time-fuse in the position of rest. The driving spring 13 which is slightly wound up acts upon the bung 17 so as to cause the beak 24 thereof to engage in a slot 30 provided on the inner extremity of the lock bolt 29. Said bolt is maintained in the position shown, first by its spring the effect of which is not counter-acted by the effect of centrifugal force, and then, so long as the setting-up of the ignition time to at least a quarter of a second has not taken place, by the pressure of the beak 24 which prevents said bolt from becoming displaced out-

wardly under the influence of sudden shocks or the like. The tail of the priming holder 25 extends through superposed holes of the two mounting plates 6b and 1f to assume a position opposite the slot 23 of the bung plate 33; it will, however, be prevented from traversing said slot by the action of the two lock bolts 28 which hold the priming holder against the pressure of the spring 26 etc. Besides, owing to the fact that the lock bolt 29 closes the slot 23 the tail is retained against traversing said slot even if the lock bolts 28 were not in the normal position.

To effect the setting-up of the ignition time, for instance to 20 seconds, the cap 2 will be rotated about half a revolution as shown in Figure 2. The escapement of the clock work is held immovable by its lock bolts, and pinion 22 is thus prevented from rotating about its own axis; it partakes, however, of the rotation of the block 7 about the longitudinal axis of the fuse and thereby entrains the internal gear wheel 20-21 and the bung 17 which in turn winds up the driving spring. The beak 24 of the bung becomes disengaged with the slot of the lock bolt 29, and the slot 23 of the plate 33 will be removed about an angle of 180° with respect to the tail 27 of the priming holder 25.

Supposing that the projectile be fired off, the lock bolts of the balance wheel and the lock bolts 28 and 29 will then be shifted outwardly under the influence of centrifugal force; pinion 22 will be allowed to rotate about its own axis and the driving spring thus expands until the slot 23 assumes a position above the tail 27. In that moment, the priming holder 25 will be shifted upwards under the action of spring 26 whereby its tail traverses the slot 23; the percussion cap containing the priming thus comes into contact with the percussion point 11; the priming will be ignited and the projectile explodes. Supposing that prior to firing off the projectile, the setting-up of the ignition time has not been effected or a faulty adjustment aiming less than a quarter of a second has taken place; in that case the projectile can not explode when leaving the gun mouth because the beak 24 still engages the slot 30 thereby preventing the lock bolt 29 from becoming displaced under the influence of centrifugal force.

Moreover, it is to be seen that the mounting plate 8 affords a stop 35 (Figure 4) cooperating with a back stop 36 set in a slot 37 (Figure 1) provided on the upper rim of the socket 6a of the case 6. The said stops cooperate in the following manner: During assembling and testing, the case 6 will be placed into the body of the fuse; then, in said case the bung 17 and the driving spring will be engaged with the barrel 14, whereby the beak 24 bears against the lock bolt 29 with a slight pressure given to the driving spring; finally, the plate 19, socket 20 and block 7 will be placed into the case 6, whereby the stop 35 will assume a position above the slot 37 of the case as shown in Figure 4, and the back stop 36 will be positioned into the slot 37. From that moment, the stop 35 bears against the back stop 36 owing to the action of the driving spring and prevents the latter from complete expansion even when removing the lock bolt 29 for withdrawing the case 6 and its contents from the body of the fuse. Besides, in the case of faulty manipulation occurring when turning the mounting plate 8 involuntarily in the direction of winding-up the driving spring, it will be possible to turn the same only about a revolution owing to the stop 35 which then reaches the back stop 36 to bear

against the opposite side thereof; in this way, the driving spring is efficaciously protected against accidental overloading liable to demolish the wheelwork and particularly to buckle or break single teeth of the gear wheels.

I claim:

1. Time-fuse for rotational projectiles of the spring driven clockwork type in which the regulation of the time of ignition takes place simultaneously with the winding of the driving spring and wherein self rotation of the clockwork is arrested by centrifugal means so long as the projectile is not fired off, said fuse having in combination a hollow fuse body adapted to be threaded to the projectile, a cap turnable on said body and carrying a winding key, a case fixedly mounted in said body, a clockwork, an axial frame carrying the clockwork, said frame being rotatably mounted in said case and engaged by said key so as to entrain the arrested clockwork in a rotatory movement about the axis of the projectile upon turning said cap, an axially disposed central guide shaft formed integral with said frame and terminating in a percussion point, a driving spring, an annular barrel surrounding said shaft and housing the driving spring, said barrel being secured to said case and having attached thereto one end of the driving spring, a spring pressed primer slidable on said shaft towards said percussion point, means actuatable by centrifugal force for normally holding said primer away from said percussion point, a bung for the driving spring rotatably mounted on said shaft and having fixed thereto the other end of said spring, said bung being, on the one hand, connected to said clockwork for effecting simultaneously the winding of said spring and the regulation of the ignition time by means of said turnable cap, winding key and rotatable frame and for driving afterwards said clockwork under the action of the driving force stored in said

spring when said clockwork has been released for self rotation to control the angular displacement of said bung during the flight of the projectile, said bung being also adapted to cooperate with the primer to allow a sudden advancing of said primer towards the percussion point during self rotation of the clockwork, and means on the case and frame, respectively, for limiting the angular displacement of the frame, in either direction thereby protecting the clockwork against deterioration during assembling of the fuse.

2. Time-fuse according to claim 1, said clockwork having a pinion rotatable about its axis as soon as the projectile has been fired off and adapted to partake of the rotation of said frame about the axis of the projectile upon turning said cap, said bung carrying at one end an internally toothed crown wheel meshing with said pinion, and forming at its other end a disk provided with a slot, said case carrying means actuatable by centrifugal force and adapted to close said slot so long as the projectile has not been fired off, and said primer forming a tail extending towards said disk and adapted to traverse the slot therein to allow sudden advancing of the primer towards the percussion point when said bung has been subjected to the control of the clockwork during the flight of the projectile.

3. Time-fuse according to claim 1, said case being provided with a slot at the top, and the means limiting the angular displacement of the frame comprising a stop on said frame and a back stop placeable into said slot after the positioning of the frame and clockwork into said case, whereby said stop bears against one side of said back stop to prevent the driving spring from complete expansion, and abuts against the other side of said back stop when turning the frame in the opposite direction upon winding said spring.

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