May 27, 1947. P. KIANG 2,421,271

FUSE CONSTRUCTION

Filed June 10, 1942 2 Sheets-Sheet 1

Fig. 1.

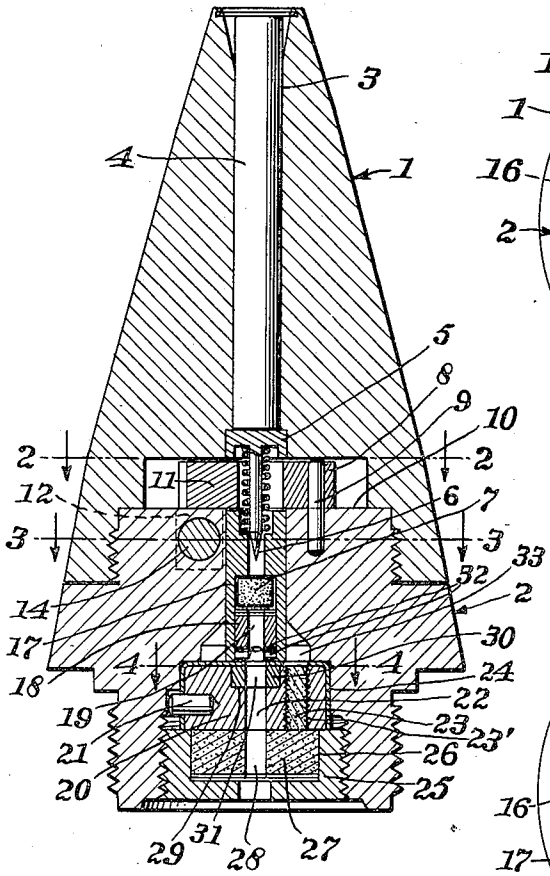


Fig. 2.

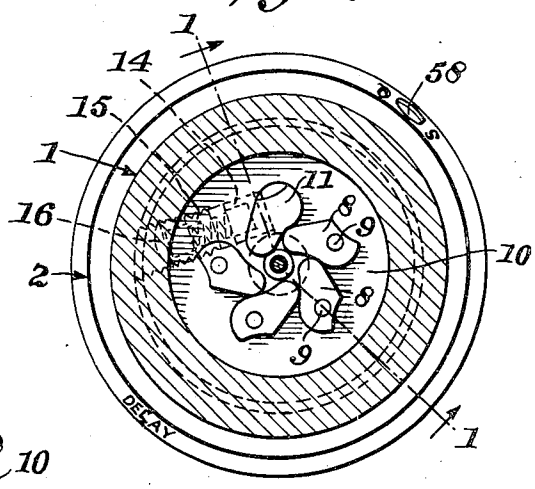


Fig. 3.

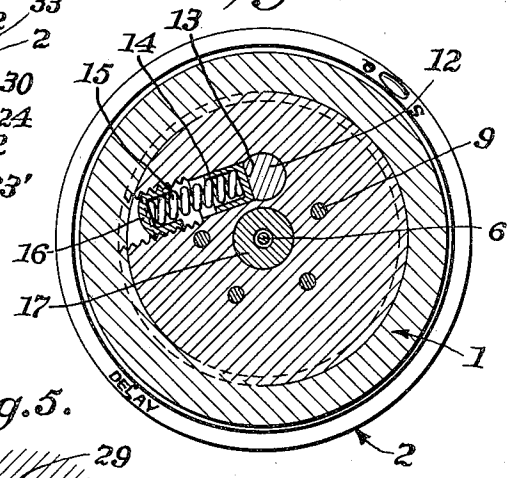


Fig. 4.

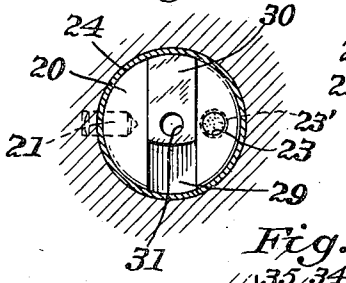


Fig. 5.

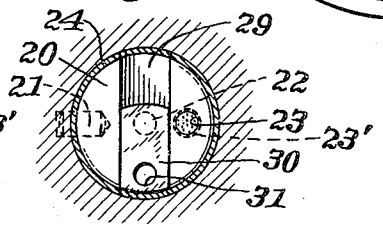
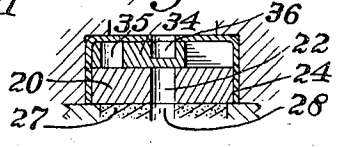


Fig. 6.



Inventor:

Piao Kiang,

By Cushman, Darby & Cushman

Attorneys.

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Fig. 7.

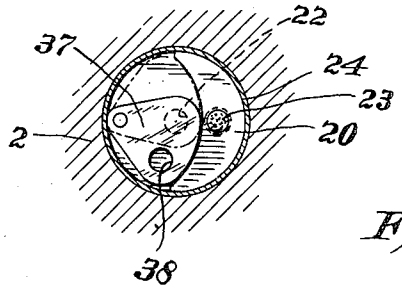


Fig. 8.

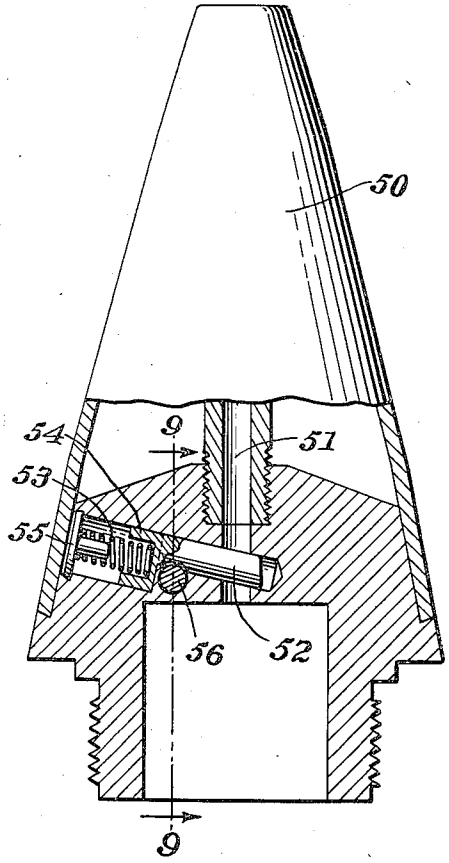
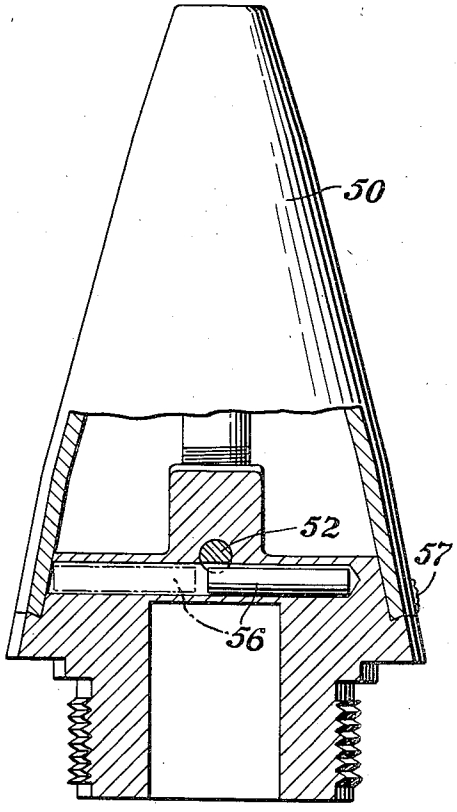


Fig. 9.



Inventor:

Piao Kiang,

By Cushman, Darby & Cushman

Attorneys.

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FUSE CONSTRUCTION

Piao Kiang, Washington, D. C.

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4 Claims. (Cl. 102—79)

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The present invention relates to a fuse construction for explosive projectiles or shells.

It is a principal object of my invention to provide a fuse construction for explosive projectiles which may be selectively adjusted to be a super-quick action or a delayed action fuse.

It is a further object of my invention to provide a fuse construction having either a super-quick or delayed action which may be easily and positively adjusted to either the super-quick or delayed action without recourse to fine mechanical adjustments.

It is a still further object of the present invention to provide a fuse construction having a super-quick or delayed action which is so simple to operate that the setting of the fuse may be manipulated to either the super-quick or delayed action in total darkness with absolute certainty as to the resultant setting of the fuse.

Another object of my invention is to provide a fuse construction having either a super-quick or delayed action in which the means for selectively adjusting the fuse to the super-quick or delayed action is completely enclosed within the shell and, therefore, completely air-tight and waterproof.

It is also an object of my invention to provide a fuse construction for explosive projectiles embodying centrifugally controlled arming means so designed as to provide an absolutely bore-safe projectile which is incapable of exploding until a determined time after the projectile has left the muzzle of the gun.

It is a still further object of my invention to provide a fuse construction selectively having two speeds of action with the means for selecting either speed fully enclosed within the shell casing and movable in response to gravity to a selected position.

Further objects and advantages of my invention will be apparent by reference to the following specification and drawings, in which:

Figure 1 is a central vertical section taken on the line 1—1 of Figure 2, showing the general fuse construction as adapted to the nose of an impact-operated explosive projectile;

Figure 2 is a transverse section taken on the line 2—2 of Figure 1;

Figure 3 is a transverse section taken on the line 3—3 of Figure 1;

Figures 4 and 5 are transverse sections taken on the line 4—4 of Figure 1;

Figure 6 is an enlarged fragmentary detail of a modified form of slide blocking member as used in the fuse of my invention;

Figure 7 is a transverse section similar to Figures 4 and 5, showing a slightly modified form of the invention;

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Figure 8 is a vertical section partly in elevation of the fuse of my invention as adapted to a centrifugally-controlled interrupter in association with a projectile of selective super-quick or delayed action, and

Figure 9 is a vertical section partly in elevation, taken on the line 9—9 of Figure 8.

Referring to Figures 1 through 5 of the drawings, the numeral 1 denotes the body portion of the nose of an impact-operated explosive projectile. The body 1 is provided with a threaded collar 2 which is adapted to be threaded to the main body of the explosive projectile. A longitudinal bore 3 is provided in the nose body 1 and is adapted to receive the impact-operated plunger 4 which may be of wood, aluminum, or any desired material. The impact plunger 4 is adapted to rest upon the head of a striker member 5 having the pointed end 6 which, when released and actuated by the plunger 4, will strike the primer 7 to ignite the fuse. Centrifugally-controlled segments 8 pivoted by the pins 9 on the surface 10 of the threaded collar 2 are normally interposed in the path of the striker 5. A key segment 11 is provided with an extension pivot 12 having a cam surface 13 adapted to engage the spring-pressed plunger 14. A compression spring 15 is tensioned in compression by the threaded cup 16 which may be adjusted to regulate the tension of said compression spring. The compression spring acting through the spring-pressed plunger 14 and the cam surface 13 will tend to resist the pivoting movement of the key segment 11 responsive to centrifugal force. A slidably movable sleeve member 17 having a bore at its upper end adapted to receive the point 6 of the striker and counterbored at its lower end to receive the primer 7 and its locking collar 18 is centrally positioned within the threaded collar 2. The locking collar 18 for the primer has a central bore 19 which will be a passage for the burning flame from the primer 7. A ported member in the form of a cylindrical block 20 is also mounted within the threaded collar 2 and is locked in alignment with the passage 19 by means of the locking pin 21. The locking pin 21 also serves to prevent the rotation of the ported member 20. The ported member 20 has a vertical bore 22 in alignment with the bore 19 and also has a threaded or ribbed bore 23 containing a quantity of slow-burning fuse powder. The threads or ribs 23' of the bore 23 serve to prevent the displacement of the powder contained in the bore. A sheet

metal cup 24, perforated in alignment with the bores 22 and 23, is placed between the ported member 20 and the sleeve 17 and functions as a gasket, as will hereinafter be described. A collar 25 having an enlarged bore 26 containing a quantity of relay powder 27 which may be fast or slow-burning, but preferably fast-burning powder, is threaded into the collar 2 to hold the ported member 20 and the sleeve 17 in their proper position. The relay powder 27 has a bore 28 therethrough in alignment with the bores 22 and 19. It will be seen that the bores 19, 22, and 28 are all in alignment and that they may form a direct passage through which the burning flame from the primer 7 can reach the booster for the main explosive charge in the shell. The ported member 20 is provided with a slideway 29 on its upper face, in which is adapted to slide the member 30. The slide member 30 is provided with a bore 31 at one of its ends, as is shown in Figures 4 and 5 of the drawings.

The operation of the above-described form of fuse of my invention is as follows:

When the slide member 30 is in the position shown in Figure 4 of the drawings, the bore 31 will be in alignment with the vertical bores or passages 19, 22, and 28, thus providing a direct passage for the burning flames and gases between the primer 7 and the booster for the main body of explosive charge in the shell. This will give a super-quick action. When the slide member 30 is in the position shown in Figure 5 of the drawings, the bore 22 will be blocked off from the bore 19 by the slide 30, thus preventing the passage of burning flame from the primer 7 directly to the main body of explosive charge. The burning flame, when blocked by the slide 30 which is in the position shown in Figure 5, will pass through the ports 32 and chamber 33 to the slow-burning powder 23 and the relay powder 27 to the booster for the main body of explosive charge. The sleeve 17 will have moved forward slightly, due to momentum upon impact, and will not interfere with the passage of burning flame through the ports 32 to the chamber 33. Thus a delayed action will be provided between the detonation of the primer 7 and the explosion of the main body of explosive charge.

The cup-shaped sheet metal member 24 has an important function as a gasket when the fuse is in the delayed action position. The burning flame and gases from the primer 7, which pass through the ports 32 into the chamber 33, will act to press the metal cup 24 tightly against the surface of the slide 30 and ported member 20 sealing and seating the slide 30 tightly within the slideway 29. The sealing prevents the passage of any of the burning flame or gases around the abutting surfaces of the slideway 29 and the slide 30 to effect a blow-by, such as would result in a super-quick action of the fuse and shell.

The centrifugal segments 8 are normally maintained in the position shown in Figure 2 of the drawings which locks the striker 5 and prevents it from striking the primer 7. However, when the shell is fired and is revolving in response to the rifling of the barrel, a centrifugal force will be attained which will force the key segment 11 to pivot against the compression of the spring 15 and allow the centrifugal segments 8 to consecutively pivot, thus releasing the striker member 5 to move in response to the impact plunger 4 and the sleeve 17 to move in response to the momentum at impact to ignite the primer 7. Upon impact, it will be apparent that either or both

the striker 5 or the sleeve 17 will move to ignite the primer. The operation of the centrifugally controlled key segment 11 and the centrifugal segments 8 is such that a projectile which is absolutely bore safe is provided.

By adjusting the threaded cup 16 to adjust the tension of the spring 15, the key segment may be prevented from pivoting until a centrifugal force attained at the speed of rotation of the shell at muzzle velocity is reached. Thereafter, when the key segment 11 has pivoted against the tension of spring 15, there will be a slight delay before all of the other centrifugal segments 8 have consecutively pivoted to unlock the striker 5 and sleeve 17. Thus, it can be seen that the shell cannot possibly be exploded until some time after its muzzle velocity has been attained. As different types and sizes of shells have different muzzle velocities, it can be seen that the adjustment of the tension for the spring 15 is necessary in order to adjust the operation of the segments 8 and 11 to respond to the different centrifugal forces attained by the different muzzle velocities.

The slide member is moved to either of the positions shown in Figures 4 and 5 of the drawings by rotating the shell, with its axis generally horizontally disposed, before it is placed in the gun. Markings will be provided on the surface of the shell to indicate when the shell is rotated and held in a manner that will place the slide 30 in the position shown in Figure 4 of the drawings to give a super-quick action. The markings may be visual, or they may take the form of a roughened or depressed surface such as indicated by 58 which may be felt by the man handling the shell. Also, these markings may, if desired, be an upraised surface such as 57 in Figures 8 and 9 of the drawings in connection with a modified form of the invention. By rotating the shell so that the marking will be either on top or on bottom, the slide may be selectively moved to either provide the super-quick action shown in Figure 4 or the delayed action shown by the position of the slide in Figure 5. After the setting of the slide 30 has been selected by rotating the shell to the proper position, and it has been determined whether the fuse shall function as super-quick or delayed, the shell is placed in the gun in that position, and the slide will be permanently set to that setting, since, when the shell is fired from the gun, the centrifugal force of the rotating shell will maintain the slide in its set position, as will be readily understood.

A modified form of slide for selectively adjusting the fuse to super-quick or delayed action is shown in Figure 6 of the drawings. In this modification, the slide 34 is provided with the super-quick bore 35 and with a delayed action imperforate bore 36. With this form of the invention, an additional sealing action to that of the gasket 24 may be obtained to prevent the blow-by of flame and gases directly from the primer around the abutting faces of the slide and slideway and through the passages 22 and 28 to the booster for the main body of the explosive charge. The burning flame and gases from the primer 7 will be entrapped within the imperforate bore 36 and will thereby seat the slide 34 tightly against the abutting surfaces of the slideway in the ported member 20, thus forming a seal.

A still further modification of my invention is shown in Figure 7 of the drawings in which the slide member 30 is replaced by a pivoted butterfly valve. The pivoted valve 37 has a bore 38 which, when the valve is moved to the super-

quick position, may be in line with the bore 22 to provide a direct passage for super-quick action. However, Figure 7 of the drawings shows the valve member 37 set for the delayed action with the passage 22 covered by the valve, thus forcing the burning flames to by-pass through the port 32 and the slow-burning powder 23 to the relay powder 27. The position of the butterfly valve may be adjusted and determined by the same manipulation of the shell as previously described in connection with the preferred form of the invention employing a slide valve.

Figures 8 and 9 of the drawings show a slightly modified form of my invention as adapted to a centrifugally controlled interrupter in association with an explosive shell of selective super-quick or delayed action.

In Figures 8 and 9 of the drawings, the nose body of the shell is indicated generally by the numeral 50 and is provided with a super-quick action primer (not shown, but located at its nose end). A bore 51 is provided to convey the burning flame from the nose of the projectile to the main body of the explosive shell. A blocking member or interrupter pin 52 is interposed in the bore 51, and when in the position shown in Figure 8 of the drawings, will prevent the direct passage of burning flame from the primer through the passage 51 to the main body of explosive shell. The blocking pin 52 is normally held in the position shown in the drawings by the compression spring 53 cooperating with the eccentrically located cup 54 integral with the pin 52. The tension of the spring 53 may be predetermined and is locked in the shell housing by the member 55. When the shell is rotating sufficiently to attain a centrifugal force in an amount to overcome the tension of the spring 53, the valve member 52 will be withdrawn from the passage 51, thus permitting the direct passage of explosive flame to reach the booster for the main body of explosive charge and giving a super-quick action. However, the valve member 52 cannot be moved unless the locking pin or slide member 56 is in the position shown in the dotted lines of Figure 9. The slide member 56 may be selectively placed in either the position shown in the solid lines or the position shown in the dotted lines by rotating the shell before it is placed in the gun. An upraised projection 57 or a depression such as 58 may be provided on the surface of the shell, and when said indication is on the top, it will indicate that the shell is held in the position to cause the slide 56 to assume the position shown by the dotted lines, thus permitting immediate explosion of the shell in response to the operation of the nose primer. By rotating the shell before placing it in the gun so that the projection 57 is on the bottom, the slide member 56 will assume the position shown by the solid lines in the drawing at Figure 9, thus locking the valve member 52 and preventing a direct passage of flame from the primer in the nose to the booster for the main body of explosive charge and giving a delayed action, since the shell must now be detonated by the delay primer (not shown) but located in the body of the shell.

It will be noted that by my invention, I have provided a fuse construction for explosive shells which may be selectively adjusted to either a super-quick or a delayed action by a very simple and fool-proof means. To adjust the shell for either super-quick or delayed action, it is only necessary to rotate the shell so that the marking on the surface of the shell will be either on top

or on bottom before placing the shell in the gun. When the shell is rotated to the position that will have the super-quick indicia on the top of the shell, the movable blocking member will be slid or moved to the position whereby a direct thru passage for the burning flame will be provided between the primer and the booster for the main body of explosive charge, thus giving a super-quick action. Merely by rotating the shell so that the super-quick indicia is on the bottom before placing the shell in the gun, the slide or blocking member will be moved to block the straight thru passage and will, therefore, cause the burning flame to by-pass through a slow-burning powder, thus giving a delayed action to the fuse. With such construction, it will be readily seen that the shell may be easily adjusted to either the super-quick or delayed action and may be done in total darkness, if necessary, with complete assurance that the shell is set to give the desired results. Since the mechanism for selecting the delay or super-quick function of the shell is fully enclosed within the shell casing, a fuse is provided that is completely air-tight and water-proof, thus assuring the proper operation of the primer at all times and under all conditions.

While I have specifically shown a fuse construction having selectively a super-quick or delayed action, it should be understood that my invention may also be applied to a projectile of delayed action but having two or more selective degrees of delayed action. For example, the direct passage for super-quick action specifically described by my invention may instead be an original or base delay passage, while the delay passage containing the slow-burning powder may be another delayed passage having a greater degree of delay with respect to the direct passage. Thus, a fuse construction selectively having two or more degrees of delayed action may be provided with the means for selecting one of the other of said delayed actions being fully enclosed in the shell casing and movable in response to gravity. In the appended claims, I intend to claim as new, the means for selecting the actions of the shell, regardless of whether the shell be of the super-quick and delay type or of the base delay and delay type.

Although I have shown the fuse construction of my invention specifically applied to the nose portions of projectiles, it should be understood that my invention is equally applicable to projectiles having the fuse constructions located in their base portions instead of the nose or wherever applicable.

I claim:

1. A fuse for explosive projectiles having an exploding charge, comprising a primer to ignite the charge, a striker member movable to ignite the primer, means to lock the striker member against movement, said means comprising a pivotal segment normally interposed in the path of said movable striker member but movable in response to centrifugal force to release said striker member for movement to ignite the primer, and adjustable spring means acting on said segment to prevent its movement until a desired centrifugal force is attained.

2. A fuse for explosive projectiles having an exploding charge, comprising a primer to ignite the charge, a striker member movable to ignite the primer, means to lock the striker member against movement, said means comprising a plurality of pivotal segments normally interposed in

the path of said movable striker member but movable in response to centrifugal force to release said striker member for movement to ignite the primer, one of said pivotal segments constituting a key segment normally locking against movement the other pivotal segments, and adjustable spring means acting on said key segment to prevent its movement until a desired centrifugal force is attained.

3. A fuse for explosive projectiles having an exploding charge, comprising a primer to ignite the charge, a striker member movable to ignite the primer, means to lock the striker member against movement, said means comprising a plurality of pivotal segments normally interposed in the path of said movable striker member but consecutively movable in response to centrifugal force to release said striker member for movement to ignite the primer, one of said pivotal segments constituting a key segment normally locking against movement the other pivotal segments, and adjustable spring means acting on said key segment to prevent its movement until a desired centrifugal force is attained.

4. A fuse for explosive projectiles having an exploding charge, comprising a primer to ignite the charge, a striker member movable to ignite the primer, means to lock the striker member against movement, said means comprising a plurality of pivotal segments normally interposed in the path of said movable striker member but consecutively movable in response to centrifugal force to release said striker member for movement to ignite the primer, one of said pivotal segments constituting a key segment normally locking against movement the other pivotal segments, said key segment having a cam surface, and adjustable spring means acting on said surface to prevent movement of said key segment until a desired centrifugal force is attained.

PIAO KIANG.

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