

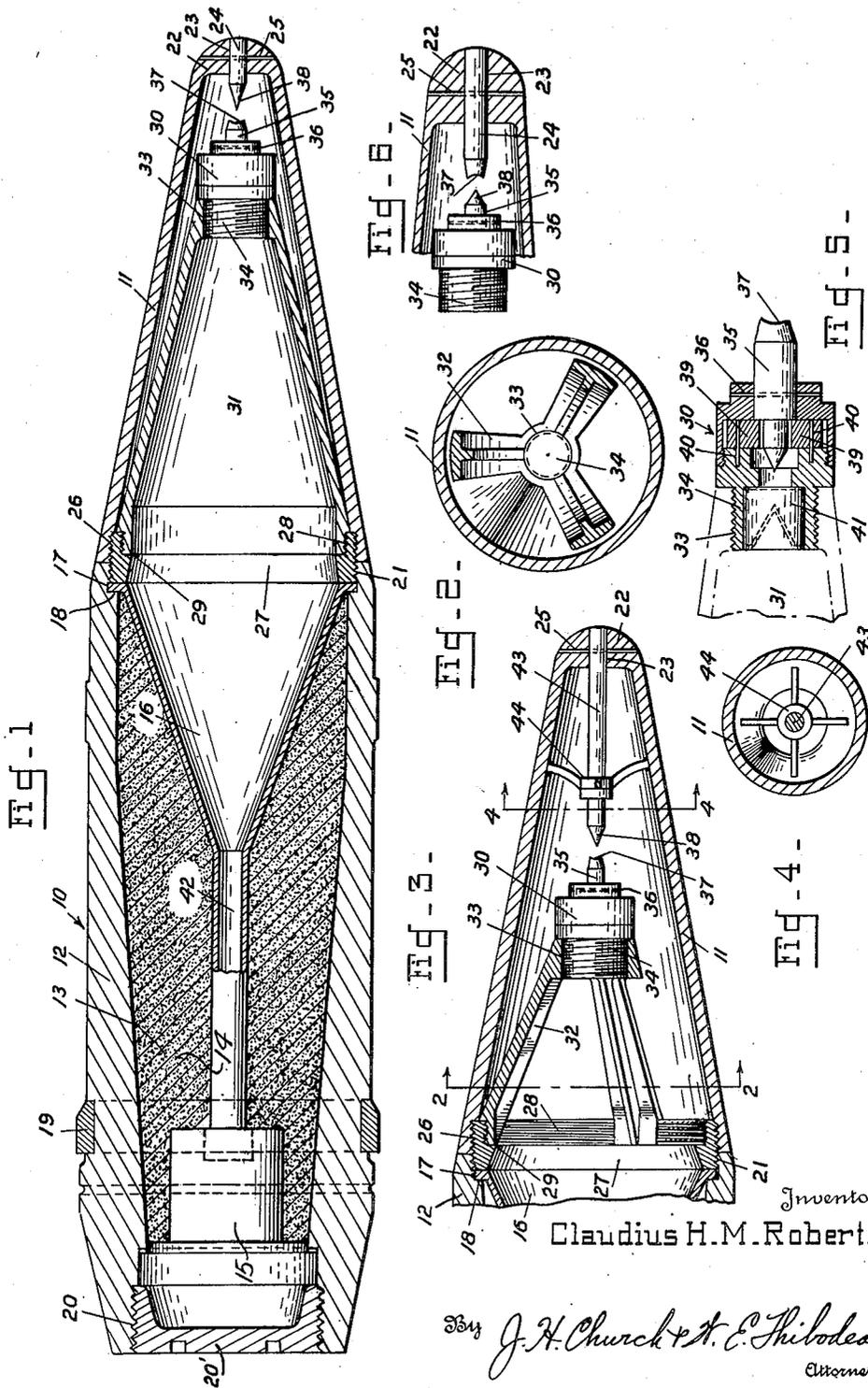
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FUZE

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FUZE

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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.

My invention relates to improvement in fuzes, particularly in connection with the use of shaped charges.

Shaped charges having conical cavities which have the effect of concentrating the blast leaving the cavity into a jet of intense penetrating power have been in use for a long time. During the present war, the addition of steel cones as liners for the cavities have made them more penetrating and persistent than unlined ones. This present invention does not apply to the shaped charge cavities per se, nor to the shape or angle of the lining of the cavities.

Shaped charge artillery ammunition with base fuzes, the type customarily employed, can be fired only at relatively low velocities because, due to the inherent delay of mechanical base fuzes, the ballistic cap crushes excessively at high velocities of impact, thus decreasing the required standoff and decreasing the effectiveness of the shell. On the other hand, if conventional nose fuzes adapted to give the necessary base initiation of the charge are assembled to the ballistic cap, crushing and distortion of the fuze and cap on impact at high velocity, especially at large angles of incidence, will cause malalignment of the fuze parts, thereby preventing dependable base initiation of the charge.

The primary object of this invention is to provide means whereby a conventional nose fuze may be mounted within the shell and attached directly to the shell body out of contact with the ballistic cap.

It is a further object of my invention to provide means of preventing axial malalignment of the fuze parts regardless of the crushing or distortion of the ballistic cap on angle impact.

It is another object of my invention to provide a firing pin for the fuze which will improve certainty of functioning on angle impact of the ballistic cap.

It is a still further object of my invention to provide a fuze for use in shaped charge projectiles whereby the functioning time of the projectile will be greatly reduced, thus materially increasing the striking velocity of the projectile.

Other objects and advantages of the invention will become apparent during the course of the following description.

The accompanying drawings forming part of the specification illustrate the manner in which

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I attain these objects. Similar numbers are used to designate like parts throughout the specification and drawings.

In the drawings:

Figure 1 is a section of a high explosive shell embodying my invention, the enclosed fuze and the booster for the shaped charge being shown in elevation,

Figure 2 is a transverse section taken on line 2-2 of Figure 3,

Figure 3 is a view generally similar to Figure 1 in which the fuze is placed further back from the nose of the shell,

Figure 4 is a transverse section taken on line 4-4 of Figure 3,

Figure 5 is a longitudinal section of the fuze shown in Figures 1 and 3, and,

Figure 6 is an alternate firing pin arrangement for use with this invention.

Referring now to the drawings, particularly to Figure 1, the numeral 10 designates generally a shaped charge artillery shell of a character adapted to be fired from a rifled barrel, and includes a ballistic cap or windshield 11 and a body portion 12. The body portion 12 is provided with a longitudinal cavity wherein the shaped charge 13, a booster 14, a detonator 15, and a funnel shaped cavity liner 16 for concentrating the jet is contained, the said cavity liner being provided with an annular flange 17 at its forward extremity for supporting the said liner and the attached booster 14 and detonator 15 on the annular shoulder 18 formed in the wall of the body portion 12. The body portion 12 is also provided with a rotating band 19 and an internally threaded opening 20 in its rear extremity to accommodate a base plug 20', and internal threads 21 at its forward end adjacent the shoulder 18.

The windshield 11 is generally conical in form, its apex being rounded to form a nose 22 provided with a bore 23 to accommodate a contact pin 24, said contact pin 24 being secured in the bore 23 by a shear pin 25. Screw threads 26 are provided on the inside of the open end of windshield 11. The windshield 11 and the body portion 12 are united by means of a ring member 27 arranged for threaded engagement with the screw threads 21 and 26 of the said windshield body portion, respectively. The inside diameter of the forward portion of ring member 27 is enlarged to provide screw threads 28 and an annular shoulder 29, the purpose of which will be pointed out later.

A fuze 30, which may be of a conventional

nose type, is mounted within the windshield 11 on a support which may be formed as a cone 31, as shown in Figure 1, or as a tripod 32 having T-shaped legs, as shown in Figures 2 and 3, the said support being arranged with an internally threaded recess 33 to engage the threaded end 34 of the fuze 30. The cone 31 and the legs of the tripod 32 are arranged to be received in threaded engagement by the screw threads 28 of the ring member 27 and to be supported on the annular shoulder 29 of the said ring member, the support being entirely out of direct contact with the windshield 11.

The fuze 30, as shown in Figures 1, 3 and 5, is provided with a firing pin 35 retained in a safe position before impact by a shear pin 36 through the body of the fuze 30. To improve certainty of functioning on angle impact, the firing pin 35 has a cup-like end 37 while the contact pin 24 has a point end 38. This arrangement of cup-like end and point may be alternated, however, and the contact pin 24 may be provided with the cup-like end 37 and the fuze firing pin with a point 38 on its forward end, as shown in Figure 6, without affecting the functioning of the invention.

Safety of the fuze 30 is further assured by the use of centrifugal safety blocks 39 mounted on the pivot pins 40. Initiation of the base detonating element 45 is secured by means of a hollow charge primer 41 adapted to project its high velocity jet down the axial tube 42 attached to the apex end of the cavity liner 46 when detonated by the firing pin 35 upon impact.

In the form shown in Figure 3, the same principles obtain, the sole difference being that the fuze 30 is placed farther back from the nose to permit additional crushing of the ballistic cap without distortion or misalignment of the fuze and base detonator. In this case, the contact pin 43 is much longer than the pin 24 of Figure 1, and is kept in alignment by a pin supporting spider 44 attached to the windshield by welding or otherwise. In all other respects, the fuze is constructed and functions as heretofore described.

In operation the contact pin 24 or 43 is driven back into the shell upon impact after shear pin 25 is broken, driving the firing pin 35 of the fuze 30 against the primer 41, the shear pin 36 being broken by the force of the impact of the contact pin against the firing pin. The safety blocks 39 have already moved out of the path of the firing pin 35 by centrifugal force during the rotating flight of the shell. The primer 41 is detonated by the firing pin 35, projecting its high velocity jet against the base detonator 45, detonating it as heretofore pointed out.

Whereas the normal functioning time of the conventional base fuzes now used in shaped charge projectiles is of the order of several milliseconds, it is estimated that the overall functioning time of the fuze of the present design will not exceed a small fraction of one millisecond, which will permit material increase in striking velocity of shaped charge projectiles, and will increase the certainty of functioning at high angles of obliquity.

It is to be understood that the form of my invention herewith shown is to be taken as a preferred example of the same, and that various modifications may be made in the combination and arrangement of parts disclosed in the drawing accompanying this invention without depart-

ing from the spirit thereof as defined in the claims annexed hereto.

Having thus described my invention, I claim:

1. A fuze of the character described comprising a shell body containing a shaped charge and a detonator therefor, a windshield for said body, securing means whereby the windshield is secured to said shell body, a fuze supported within said windshield, said fuze being provided with a firing pin and safety means for the said firing pin, supporting means attached to and cooperating with the said securing means to support the said fuze within the said windshield without contact therewith, a slidable contact pin supported by said windshield and releasably connected therewith, said contact pin being responsive to the impact of the windshield against a target to strike against the firing pin of said fuze, and cooperating contact components comprising a cup-like terminus formed on a slidable pin and a pointed terminus on an oppositely disposed pin, one of the said components being formed on the firing pin of the said fuze and the other component being formed on the end of the said contact pin opposing the said one of said components whereby non-sliding contact between the contact pin and the firing pin may be obtained at high angles of obliquity.

2. The structure of claim 1 wherein the supporting means for the fuze comprises a generally cone-shaped member arranged for positioning within the windshield and having means for attachment with the said securing means out of contact with the said windshield.

3. A structure of claim 1 wherein the supporting means for the contact pin comprises a pin supporting spider attached to the said windshield.

4. The structure of claim 1 wherein the safety means for the fuze firing pin comprises pivotally connected safety blocks positioned within the said fuze adjacent the said firing pin, said safety blocks being responsive to centrifugal force, and a pin shearable upon impact of the said contact pin upon the said firing pin.

5. In a projectile comprising a hollow body supporting at its open end a windshield extending forwardly of said open end and a shaped charge fuze within said windshield in spaced relationship and in alignment with a fuze firing pin releasably supported in the nose of said windshield, a funnel-shaped cavity liner supported at said open end having its cylindrical portion extending in opposite direction to said windshield in alignment with said fuze firing pin and said fuze, the free end of said cylindrical portion fixed to a detonator positioned in the base of said hollow body, an explosive material between said cavity liner and said hollow body, said cylindrical portion providing a conduit for detonation of said detonator by said fuze.

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