July 30, 1946. C. F. ZAPPONE 2,405,085

AMMUNITION TIME FUSE

Filed April 6, 1943

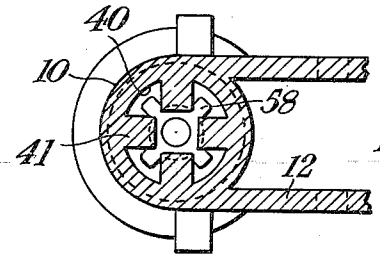


Fig. 3.

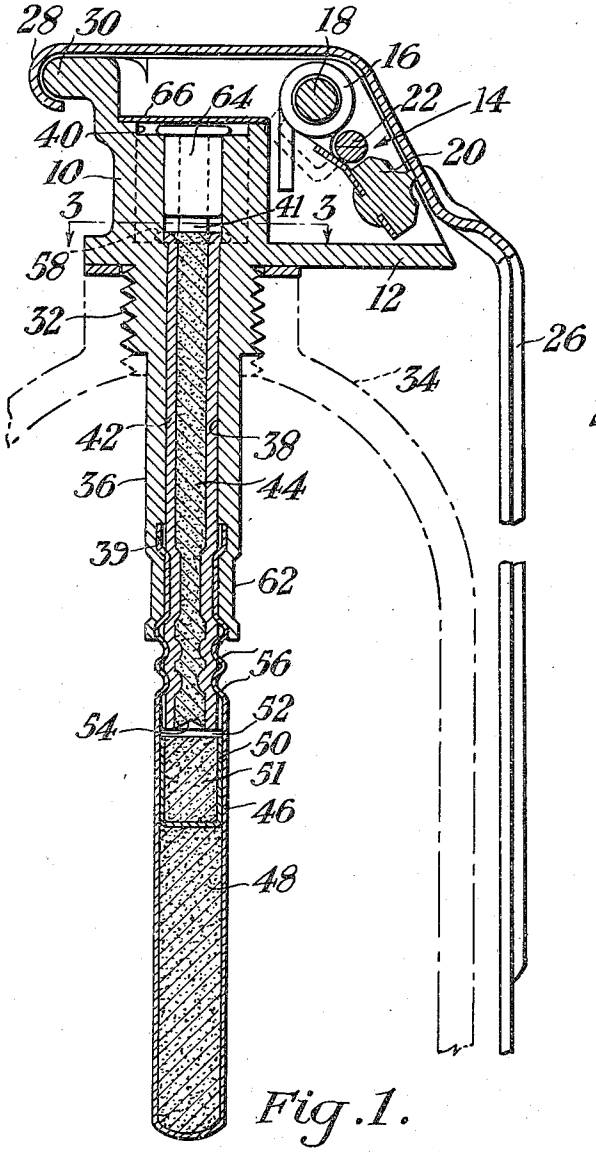


Fig. 1.

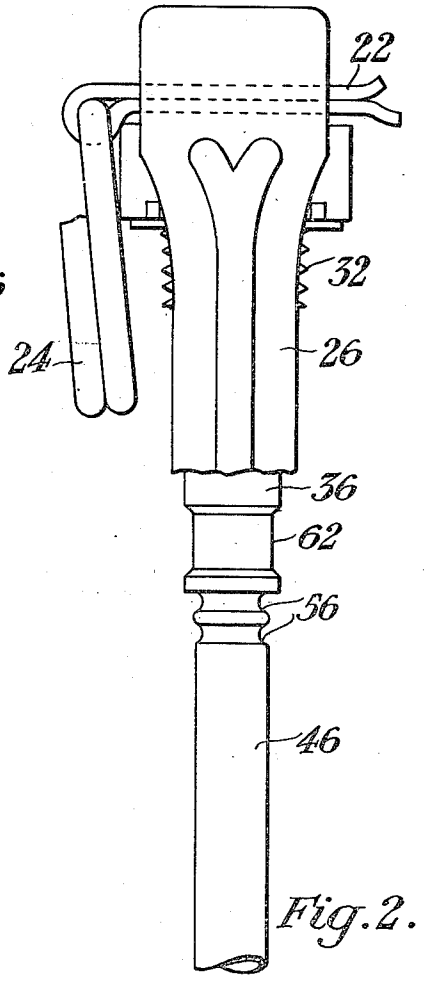


Fig. 2.

INVENTOR
Charles F. Zappone.
BY
Albert J. Henderson
HIS ATTORNEY

Patented July 30, 1946 2,405,085

UNITED STATES PATENT OFFICE

2,405,085

AMMUNITION TIME FUSE

Charles F. Zappone, Greensburg, Pa., assignor to Paragon Manufacturing Company, New Derry, Pa., a corporation of Pennsylvania

Application April 6, 1943, Serial No. 481,989

2 Claims. (Cl. 102—85.6)

1

This invention relates to ammunition and explosive devices and, more particularly, to time fuses for hand grenades and the like.

Ammunition fuses of the type indicated may depend upon a powder train to delay explosion of the projectile for a predetermined period. Delay means of this nature is simple and economical to manufacture in quantity and may be applied in the fuse with a minimum of skill and effort. Powder trains are, however, subject to the defects of failure to perform and untimely operation due to a variety of causes chief among which are uneven burning or non-ignition of the powder and premature extinction. Fuses for delaying explosion of hand grenades, for example, are particularly dangerous if subject to misfires, as described, with the usual proximity of thrower and target.

An object of this invention is to insure a predetermined time delay before the fuse ignites the explosive or gas forming mixture.

Another object of the invention is to simplify the manufacture of such fuses while improving the igniting characteristics.

Another object of the invention is to accomplish the foregoing purposes without rendering it necessary to materially alter the ammunition device to which the fuse is applied.

Other objects and advantages will become apparent from the following description taken in connection with the accompanying drawing, wherein:

Fig. 1 is a longitudinal section through the fuse assembly;

Fig. 2 is a side elevation; and

Fig. 3 is a partial cross-section on line 3—3 of Fig. 1.

Referring more particularly to the drawing, the fuse body 10 may be of standard form, as used for many years in conjunction with the common type of hand grenade. Thus the body 10 is provided with the usual offset housing 12 containing the striker mechanism, designated generally by the reference numeral 14. Although not forming part of this invention, this striker mechanism 14 may comprise a coil spring 16 supported in the housing 12 on a pin 18 and carrying a striker 20 which is held in safe position by a safety pin 22 which extends through the walls of the housing 12 and may be forcibly removed by manual effort applied to a ring 24 attached to a projecting end thereof. A lever 26 is loosely anchored at one end by an inturned portion 28 thereon engaging a flange 30 on one end of the housing 10 and extends across the housing 12

2

into operative engagement with the striker 20 in its safe position. Upon removal of the safety pin 22 as described, the striker 20 may be maintained in its safe position by manual pressure applied to the lever 26 against the bias of the coil spring which tends to rotate the striker in counterclockwise direction. When the grenade is thrown, the loose mounting of the lever 26 permits it to become detached from the grenade under pressure of the coil spring 16 which thereupon carries the striker 20 into operating position.

Referring further to the body 10 which is generally cylindrical in form, a threaded projection 32 is provided thereon for attachment of the usual shell 34 of the hand grenade partly shown in broken lines in Fig. 1. Depending from the threaded projection 32 is an elongated projection 36, reduced in diameter from the threaded projection 32, and having an axial opening 38 extending completely therethrough and forming a junction with an enlarged axial opening 40 in the body 10. The axial opening 38 may have a counterbored portion 39 extending a short distance from the end opposite the junction described for a purpose which will be apparent hereinafter. The wall of the enlarged opening 40 is provided with a plurality, in this instance four, of longitudinal ribs 41 which may be equally spaced around the periphery thereof and extend longitudinally from the open end of the body 10 to the junction with the axial opening 38. Any desired number of ribs may be provided without departure from the salient features of this invention as will be apparent. The four ribs 41 shown may each project into the opening 40 short of the axial opening 38 and serve to reduce the free area within enlarged opening 40 to more or less rectangular form. It will be noted, however, that the ribs 41 do not project into engagement with each other but that a passage remains between adjacent ribs and the free area for a purpose described hereinafter.

As previously indicated, the time fuse of this invention is of the powder train type and the construction and arrangement of the portions now to be described in the fuse body forms the subject matter of this invention. Accordingly, a time delay element 42 comprising a tubular portion containing a core 44 of combustible material, such as black powder, is provided for insertion in the fuse body 10. The delay element 42 may conveniently be formed by cutting the desired amount from a length of prefabricated material which can be purchased in coils several feet in length on the open market. The tubular

portion of the delay element 42 is preferably of metal, such as brass or lead, and the powder charge forming the core 44, which is solidly packed therein, may be chosen to give the required burning time, usually four or five seconds, as desired.

The delay element 42 is preferably a close sliding fit in the fuse body 10 and before assembly therein a small quantity of powder is removed from one end leaving a tubular end portion which projects into the enlarged opening 40 of the body. This tubular end may be punched or swaged in the body 10 so that a head 58 comprising a plurality, in this instance, four projections are formed thereon extending between the ribs 41 and serving to provide sealing relationship between the element and the body.

The opposite end of the delay element 42 projects from the counterbored end 39 of the body after being secured as described. Preferably, the core 44 of this projecting end portion is countersunk, as at 54, to increase the surface area of the powder and thus enlarge the flame produced thereby. A detonator element 46 consisting of a tubular portion of metal or other suitable material containing a core 48 of an explosive powder, such as tetryl, is mounted in the counterbored portion 39 by telescopic engagement with the projecting end of the delay element. A capsule 50 surmounts the core 48 and a space 52 is left between the end of the delay element and the capsule when the parts are assembled. In this embodiment the capsule may contain a fulminate charge 51, but it will be understood that other types of fuses may be made by substituting black powder for the fulminate and detonator charges described.

The elongated projection 36 of the body 10 is of sufficient length to extend approximately midway of the telescoped ends of the detonator element 46 and the delay element 42 when inserted and secured in the body, as described. The counterbore 39 accommodates the end of the detonator element 46 so that the portion of the elongated projection 36 which encloses the telescoped ends may now be crimped or swaged to form a depression 62 in the elongated projection 36 and a corresponding depression in the telescoped ends of the detonator element 46 and the delay element 42. In this manner, these elements are held rigidly in position in the elongated projection 36.

In order to retain the detonator and delay elements in assembled relation and, more importantly, to provide a seal therebetween, the telescoped ends of these members may be provided with a plurality of corrugations 56 extending circumferentially thereof and which may conveniently be formed after assembly of these elements by spinning, rolling or swaging. The corrugations 56 are preferably located at some distance from the end face of the detonator element 46 in order to provide an unbroken surface on that portion of this element which is inserted in the fuse body 10. A primer 64 of any suitable type, which will explode upon percussion by the striker 20, is mounted in the ribbed opening 40 and a sealing member 66 secured in overlying relation thereto. The completed fuse is ready for assembly in the grenade or other device of which it forms a component.

The operation of the fuse occurs upon release of the grenade in action which will permit the striker 20 to contact the primer 64 through the sealing member 66 with sufficient force or percussion to explode the primer 64 and ignite the charge 44 of the delay element 42.

Owing to the seal established by the head 58 at the junction of the axial opening 38 with the enlarged opening 40 in the body 10, there is no opportunity for the explosive charge of the primer 64 to by-pass the delay element 42 and ignite the detonator charge prematurely. The closely packed core 44 of combustible material in the delay element will burn evenly at the predetermined rate and, when it is substantially consumed after four or five seconds or other predetermined period, the fulminate charge 51 in capsule 50 will operate to explode the detonator material 48 and the function of the fuse is fulfilled. As is well-known, the grenade shell 34 may contain an explosive charge which operates instantaneously upon explosion of the detonator element 46 to cause the required damage at the target. In the case of gas grenades the fulminate and detonator charges may be replaced with black powder which will ignite and cause release of gaseous medium from the grenade casing.

It will be observed that when the core 44 forming the delay charge is substantially consumed, there is no opportunity for a backfire from the next powder in the train owing to the seal established by the corrugations 56 in the detonator element 46 and the delay element 42. Thus, the fuse assembly is sealed at the initial and finishing stages of the time delay, so that after operation of the primer 64 the combustible material of the delay charge 44 must be substantially consumed from the primer to the detonator before the latter can operate. As a solid charge of combustible material is utilized for the time delay element, substantially even burning will occur and the predetermined time delay is assured before the explosive mixture in the grenade is ignited.

From the foregoing it will be apparent to those skilled in the art that the standard form of hand grenade fuse is adapted without substantial change to embody the features of this invention. The solid charge delay element can readily be produced from standard materials purchasable on the open market. Desired variations can be made in the length of the time delay by varying the type of combustible material to give the required characteristics. Other changes can be made in the arrangement and combination of parts and in the details of construction herein disclosed within the scope of the appended claims without departing from the spirit of the invention.

I claim:

1. A time fuse for a grenade casing comprising in combination, a hollow body having the opening therein enlarged at one end, a plurality of spaced ribs projecting from the interior wall of said enlarged open end and reducing the free area thereof, a primer supported by said ribs in said free area, a detonator element projecting from said body opposite said enlarged open end, and a time delay element in said body including a tubular portion having one end adjacent said primer and the other end connected to said detonator element, said tubular portion having a plurality of radial projections formed on said adjacent end and extending between said ribs for sealing said portion to said body.

2. A time fuse for a grenade casing comprising in combination, a hollow body having the opening therein enlarged at one end to define a shoulder therein, a plurality of spaced ribs pro-

jecting from the interior wall of said enlarged open end to the margin of said shoulder and reducing the free area of said end to substantially equal the area of said opening, a primer supported by said ribs in said free area and spaced from said shoulder, a detonator element projecting from said body opposite said enlarged open end and being peripherally deformed into fixed relation with said body, and a time delay

element in said body including a tubular portion having one end adjacent said shoulder and the other peripherally deformed into fixed relation with said detonator element, said tubular portion having a plurality of radial projections formed on said adjacent end and extending between said ribs for sealing said portion to said body.

CHARLES F. ZAPPONE.