

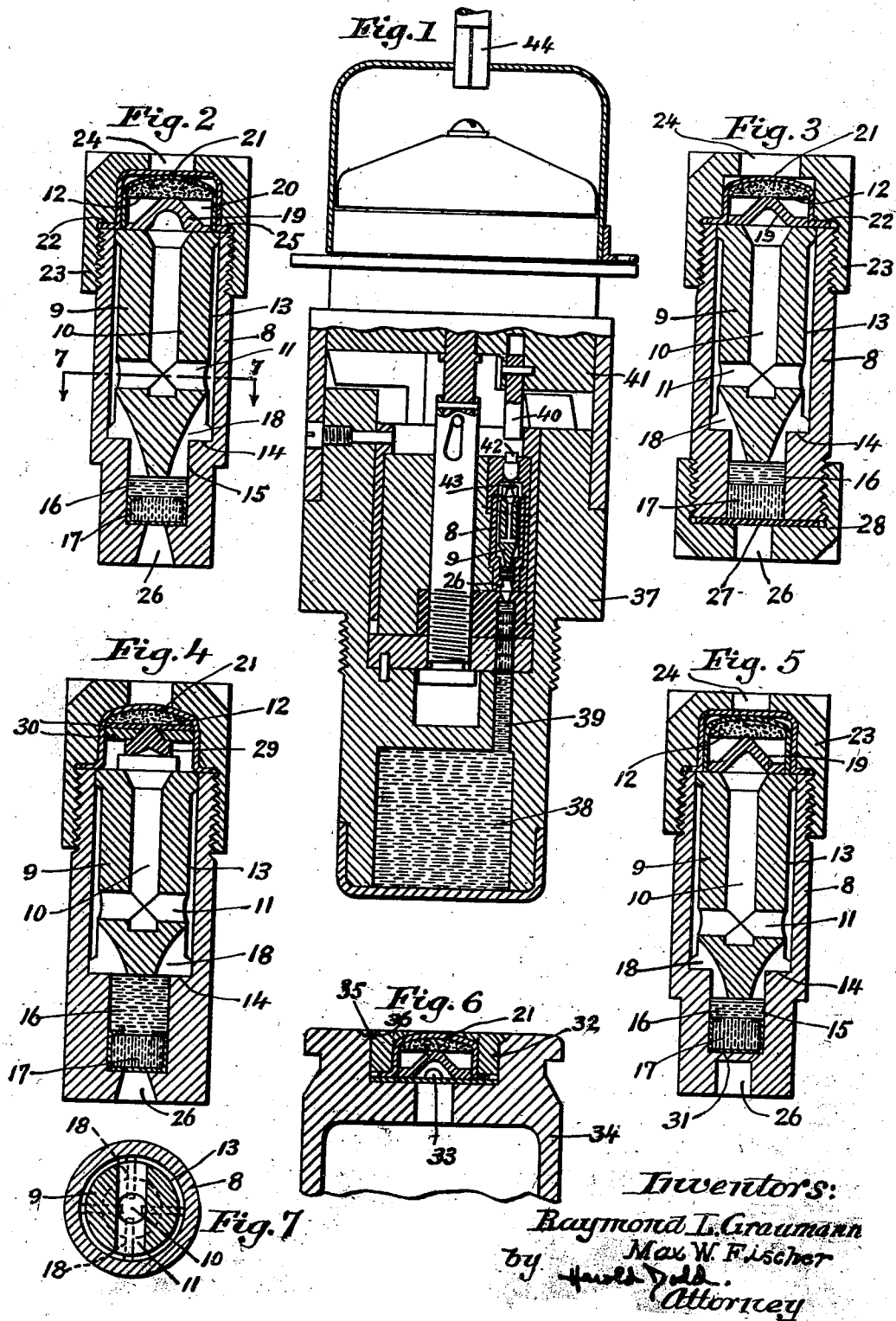
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DELAY ELEMENT FOR FUSES

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DELAY ELEMENT FOR FUSES

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This invention relates to a device for delaying the passage of the flame from the percussion explosive material of a primer to the detonator of a fuse.

Among the objects of this invention are: To provide means for causing a predeterminable delay, variable within certain limits, in the time of passage of flame from the primer to the delay pellet and detonator; to separate the detonator from the fuse train by a septum to produce a more violent irruption of the detonator gasses into the fuse train; and to provide a moisture proof inclosure for the primer which also insures obturation of the gases.

With the above and other objects in view, the invention consists in the construction, combination and arrangement of parts as will be herein-after more fully described.

Reference is to be had to the accompanying drawing forming a part of this specification in which like reference characters indicate corresponding parts throughout the several views and in which:

Fig. 1 is a side elevation, mainly in section, of a complete fuse with the present invention assembled therein;

Figs. 2 to 6 are longitudinal sections of various embodiments of the invention; and

Fig. 7 is a transverse section on the line 7—7 of Fig. 2.

Our invention is adapted for use in fuses in which it is desired to cause a time delay between the explosion of the primer and the firing of the booster charge thereby. The several modifications illustrated are, in general, similar, but vary in certain details that produce somewhat different effects.

Referring particularly to Fig. 2, the delay element comprises a body 8 having in it a chamber to receive the baffle member 9 in which is a longitudinal bore 10 that communicates with a transversely extending bore 11, the two forming a passage for flame from the percussion explosive wafer 12 of the primer into the chamber 13 defined by a circumferential channel in member 9 and the wall of body 8. The lower end of the baffle member is seated upon a shoulder 14 formed at the junction of the chamber for member 9 with smaller chamber 15 in which the delay pellet 16 and the detonator 17 are placed. Slots 18 in baffle 9 place the chamber 13 in communication with the chamber 15 and permit the passage of gases and flame from the former chamber to the latter to ignite delay pellet 16. The volume of chamber 13 may be varied by changing the depth or the width of the channel in member 9, which will result in a difference in the pressure of the gases in the delay element during the burning of delay pellet 16 and hence will control, to a certain extent, the rate of burning of that pellet.

Experiments have shown that the difference in time so brought about may be as great as .005 of a second. It is to be understood that the delay introduced by the gas pressure is in addition to, and not a substitute for, the control of the rate of burning by compressing the material of the delay pellet.

The percussion wafer 12 is in contact with anvil 19 that is disposed above the upper end of flame duct 10 and is inclosed, together with the anvil, in a cup 20, preferably of thin copper. Heretofore the inclosure of the percussion wafer has not been moisture-proof and to overcome this defect we have provided a second copper cup 21 disposed over cup 20 and having a laterally extending flange 22 at its open end. A cap 23 having in it an opening 24 for the passage of the firing pin is in screw-threaded engagement with body 8 and has formed in it a shoulder 25 that clamps flange 22 tightly against the end of body 8 and effectively excludes all moisture. The aperture 26 is provided in the lower end of body 8 to permit passage of the flame from the detonator to the fuse train. In Fig. 2 a standard type of primer is used with the addition of the moisture excluding cup 21.

The form of delay element shown in Fig. 3 is very similar to that in Fig. 2 but differs therefrom in that the percussion wafer 12 is inclosed in the moisture excluding cup 21, but the usual cup 20 has been omitted. A further difference is that a relatively thick septum or wall 27 is interposed between detonator 17 and aperture 26 to prevent the detonator gases from passing to the fuse train until a high pressure has been built up in body 8, which pressure, after it has become sufficiently great to rupture septum 27, causes a violent outrush of the gases. The septum 27 is a disc which may be of metal of suitable thickness and physical properties or of any other material adapted to the purpose in view, and is retained in place through being clamped between the end of body 8 and a cap 28 screwed thereon.

In Fig. 4 a percussion wafer 12, anvil 29 and washers 30 are assembled in cup 21 to form a unit therewith. Otherwise the construction is like that of Fig. 2.

Fig. 5 shows a combination of the features of the modifications disclosed in Figs. 2 and 3 but instead of clamping a separate element against body 8 to form a restraining septum between detonator 17 and aperture 26 an integral wall 31 is left between chamber 15 and aperture 26, which serves the same purpose as does disc 27 in Fig. 3.

The application of the moisture proofing feature of our invention to a small arms cartridge case is shown in Fig. 6. The moisture proofing cup 21 is clamped between the annular member 32 and the disc 33 seated on the bottom of the

primer cavity in cartridge case 34. A portion 35 of the head of the cartridge case is spun over the sloping shoulder 36 of annular member 32.

Fig. 1 illustrates the location of the delay element when assembled in a fuse, the parts of which are shown in the armed position. As is general practice the stock 37 carries a booster charge 38 that is continued upwardly in the fuse train 39. The striker 40 is moved downward by the inertia of member 41 upon impact of the bomb and drives firing pin 42 against the primer, designated generally by 43, which causes the explosion of the percussion wafer 12 thereof. The flame from the wafer rushes through bores 10 and 11 into chamber 13 and thence through slots 18 to delay pellet 16 which burns and ignites detonator 17, the flame and gases from which are communicated to the powder train and thence to booster charge 38. For the purpose of concrete illustration there has been shown in Fig. 1 a tail fuse for an aerial bomb, there being connected to the fuse a shaft 44 that is rotated, during the fall of the bomb, by fins attached thereto (not shown), to move the parts of the fuse from the unarmed to the armed position.

It will be understood that the above description and accompanying drawing comprehend only the general and preferred embodiment of our invention and that various changes in construction, proportion and arrangement of parts may be made within the scope of the appended claims without sacrificing any of the advantages of our invention.

This invention may be manufactured and used by or for the Government of the United States for governmental purposes without the payment of any royalty thereon.

We claim:

1. A delay element for fuses, comprising a body having a first chamber, a second chamber of less cross-sectional area than the first chamber in communication with said first chamber, and an aperture extending from an exterior surface of said body to the second chamber; a baffle member in said first chamber having a longitudinal bore of less length than the member, a transversely extending passage through the member connecting with said bore, a circumferential channel in the surface of said member of less width than the length of the member and grooves extending from one end of said member to said channel; a delay pellet in said second chamber adjacent said end of said member, detonating material adjacent to said pellet, an anvil disposed at the other end of said member, percussion explosive material contacting said anvil, a readily deformable member in which said anvil and said material are disposed, a flanged cup of readily deformable moisture proof material inclosing said percussion material, said anvil and said deformable member, and a cap engaged with said body to clamp the flange of said cup in moisture proof contact with said body, said cap being apertured to permit a firing pin to contact the base of said cup.

2. A delay element for fuses, comprising a body having a first chamber, a second chamber of less cross-sectional area than the first chamber in communication with said first chamber, and an aperture extending from an exterior surface of said body to the second chamber; a baffle member in said first chamber having a longitudinal bore of less length than the member, a

transversely extending passage through the member connecting with said bore, a circumferential channel of less width than the length of the member and grooves extending from one end of said member to said channel; a delay pellet in said second chamber adjacent said end of said member, detonating material adjacent said pellet, a relatively strong septum between said detonating material and the said aperture in said body, an anvil disposed at the other end of said member, percussion explosive material contacting said anvil, a flanged cup of readily deformable moisture proof material inclosing said percussion material and said anvil and a cap engaged with said body to clamp the flange of said cup in moisture proof contact with said body, said cap being apertured to permit a firing pin to contact the base of said cup.

3. A delay element for fuses, comprising a body having a first chamber, a second chamber of less cross-sectional area than the first chamber in communication with said first chamber, an aperture extending from an exterior surface of said body to the second chamber; a baffle member in said first chamber having a longitudinal bore of less length than the member, a transversely extending passage through the member connecting with said bore, a circumferential channel of less width than the length of said member and grooves extending from one end of said member to said channel; a delay pellet in said second chamber adjacent said end of said member, detonating material adjacent said pellet, a relatively strong septum between said detonating material and the said aperture in said body, an anvil disposed at the other end of said member, percussion explosive material contacting said anvil, a flanged cup of readily deformable moisture proof material disposed at the other end of said member, a percussion explosive material disposed in the closed end of said cup, washers to retain said material in said cup, and an anvil extending through said washers to contact said percussion material; and a centrally apertured cap in screw threaded engagement with said body to clamp the flange of said cup against said body.

4. A delay element for fuses, comprising a body having a first chamber, a second chamber of less cross-sectional area than said first chamber in communication with said first chamber, a closure for one end of said second chamber, a centrally apertured cap in screw thread engagement with said body to clamp said closure against said body; a baffle member in said first chamber, said member having in it a longitudinal bore of less length than the length of said bore, a transverse bore communicating with said longitudinal bore and a circumferential channel of less width than the length of said channel and grooves extending from said channel to one end of said member; an anvil mounted at the other end of said member, percussion explosive material disposed in contact with said anvil, a deformable moisture proof cup of moisture proof material having a flange at its open end disposed around said anvil and said material, a centrally apertured cap in screw threaded engagement with said body to clamp the flange of said cup against said body, detonating material disposed against said closure and a delay pellet interposed between said detonating material and said baffle member.

5. A delay element for fuses, comprising a body having a first chamber, a second chamber of less

cross-sectional area than said first chamber in communication with said first chamber and a recess in the end of said body adjacent said second chamber but not in communication therewith; a baffle member in said first chamber having a longitudinal bore of less length than said member, a transverse bore communicating with said longitudinal bore and a circumferential channel of less width than the length of said member, and grooves extending from said channel to an end of said member; an anvil disposed at the other end of said member, percussion explosive material in contact with said anvil, a cup of readily deformable moisture proof material having a flange at its open end disposed around said anvil and said material, a centrally apertured cap in screw threaded engagement with said body to clamp the flange of said cup against said body, detonating material in said second chamber and a delay pellet interposed between said detonating material and said member.

6. A delay element for fuses, comprising a body having a first chamber, a second chamber of less cross-sectional area than the first chamber in communication with said first chamber, and an aperture extending from an exterior surface of said body to the second chamber; a baffle member in said first chamber having a longitudinal bore of less length than the member, a transversely extending passage through the member connecting with said bore, a circumferential channel of less width than the length of said member and grooves extending from one end of said member to said channel; an anvil disposed at the other end of said member, percussion explosive material contacting said anvil, a readily deformable member in which said anvil and said material are disposed, a flanged cup of readily deformable moisture proof material inclosing said percussion material, said deformable member and said anvil and a cap engaged with said body to clamp the flange of said cup in moisture proof contact with said body, said cap being apertured to permit a firing pin to contact the base of said cup.

7. A delay element for fuses, comprising a body having a first chamber, a second chamber of less cross-sectional area than the first chamber in communication with said first chamber, an aperture extending from an exterior surface of said body to the second chamber; a baffle member in said first chamber having a longitudinal bore of less length than the member, a transversely extending passage through the member connecting with said bore, a circumferential channel of less width than the length of said member and grooves extending from one end of said member to said channel, an anvil disposed at the other end of said member, percussion explosive material contacting said anvil, a flanged cup of readily deformable moisture proof material inclosing said percussion material and said anvil and a cap engaged with said body to clamp the flange of said cup in moisture proof contact with said body, said cap being apertured to permit a firing pin to contact the base of said cup.

8. A delay element for fuses, comprising a body having a first chamber, a second chamber of less cross-sectional area than the first chamber in communication with said first chamber, an aperture extending from an exterior surface of said body to the second chamber; a baffle member in said first chamber having a longitudinal bore of less length than the member, a transversely

extending passage through the member connecting with said bore, a circumferential channel of less width than the length of said member and grooves extending from one end of said member to said channel; an anvil disposed at the other end of said member, percussion explosive material contacting said anvil, a flanged cup of readily deformable moisture proof material disposed at the other end of said member, percussion explosive material disposed in the closed end of said cup, washers to retain said material in said cup, and an anvil extending through said washers to contact said percussion material; and a centrally apertured cap in screw threaded engagement with said body to clamp the flange of said cup against said body.

9. A delay element for fuses, comprising a body having a first chamber, a second chamber of less cross-sectional area than said first chamber in communication with said first chamber, a closure for one end of said second chamber, a centrally apertured cap in screw thread engagement with said body to clamp said closure against said body; a baffle member in said first chamber, said member having in it a longitudinal bore of less length than the length of said bore, a transverse bore communicating with said longitudinal bore and a circumferential channel of less width than the length of said channel and grooves extending from said channel to one end of said member, percussion explosive material disposed in contact with said anvil, a readily deformable moisture proof cup having a flange at its open end disposed around said anvil and said material, and a centrally apertured cap in screw threaded engagement with said body to clamp the flange of said cup against said body.

10. A delay element for fuses, comprising a body having a first chamber, a second chamber of less cross-sectional area than said first chamber in communication with said first chamber and a recess in the end of said body adjacent said second chamber but not in communication therewith; a baffle member in said first chamber having a longitudinal bore of less length than said member, a transverse bore communicating with said longitudinal bore and a circumferential channel of less width than the length of said member, and grooves extending from said channel to an end of said member; an anvil disposed at the other end of said member, percussion explosive material in contact with said anvil, a cup of readily deformable moisture proof material having a flange at its open end disposed around said anvil and said material, and a centrally apertured cap in screw threaded engagement with said body to clamp the flange of said cup against said body.

11. A delay element for fuses, comprising a body, a member in said body provided with a flame duct having an opening at one end of said member and openings on the side thereof, a channel in the surface of said member of less width than the length of said member, passages from said channel to the other end of said member, an anvil seated adjacent the first mentioned end of said member, percussion explosive material in contact with said anvil, a deformable moisture proof cup having a flange at its open end disposed around said anvil and said percussion material and means to clamp the flange of said cup against said body.

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