Dec. 2, 1947. A. M. BIGGAR 2,431,683

DETONATOR TESTER

Filed Feb. 23, 1945

Fig. 1.

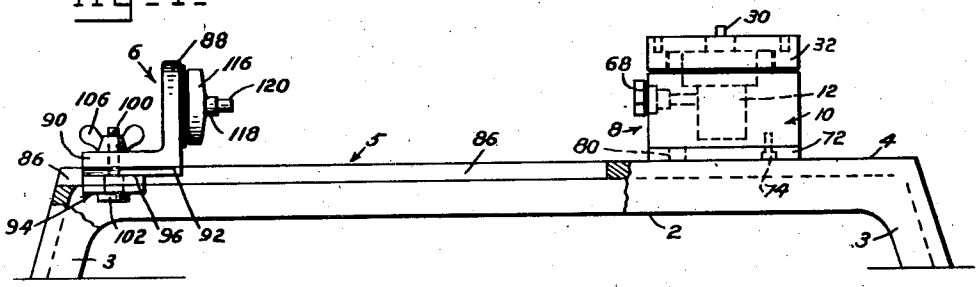


Fig. 2.

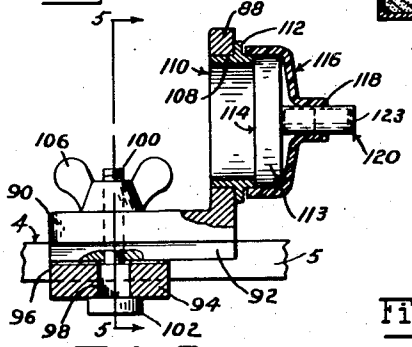


Fig. 4.

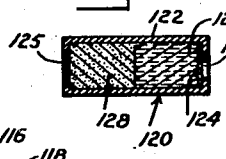


Fig. 3.

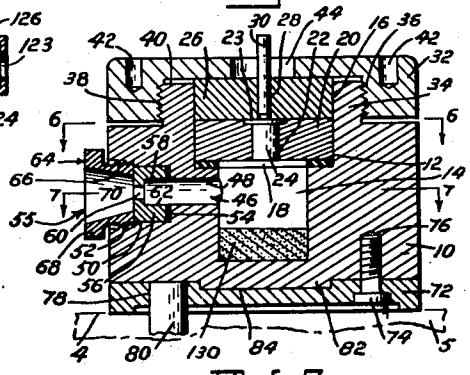


Fig. 5.

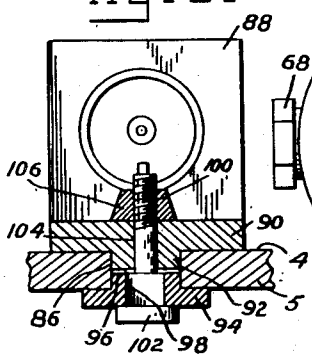


Fig. 6.

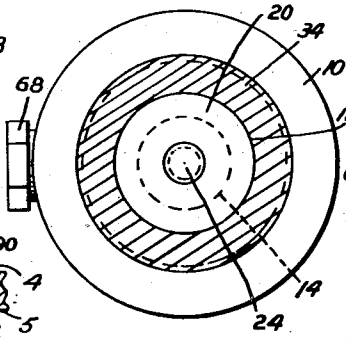


Fig. 7.

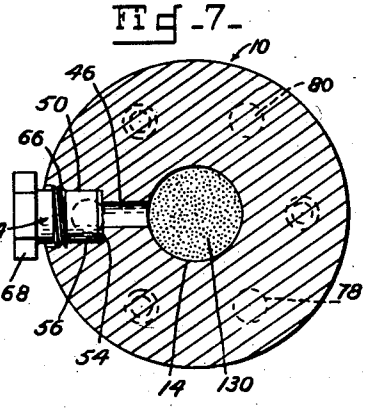


Fig. 8.

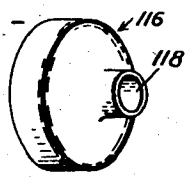
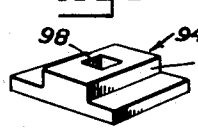


Fig. 9.



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UNITED STATES PATENT OFFICE

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DETONATOR TESTER

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Application February 23, 1945, Serial No. 579,482

7 Claims. (Cl. 73—167)

(Granted under the act of March 3, 1883, as amended April 30, 1928; 370 O. G. 757)

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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.

This invention relates to the testing of detonators.

A purpose of the invention is to provide a device for testing of detonators.

Another purpose of the invention is to provide a means of applying a hot flash of flame to a detonator.

A further purpose of the invention is to provide a support for a detonator while the detonator is being tested.

Another purpose of the invention is to provide a source of a hot flash of flame for testing detonators.

Other purposes of the invention will become apparent from the following description and drawings in which,

Figure 1 is an elevational sectional view of a device embodying the invention,

Figure 2 is a detailed partly sectional elevation of the detonator support shown in Figure 1.

Figure 3 is a detailed sectional elevation of the flash producer shown in Figure 1.

Figure 4 is a longtudinal sectional view of a detonator.

Figure 5 is a view taken along the line 5—5 of Figure 2.

Figure 6 is a view taken along the line 6—6 of Figure 3.

Figure 7 is a view taken along the line 7—7 of Figure 3.

Figure 8 is a perspective detail view of the plastic detonator holder shown in Figures 1 and 2, and

Figure 9 is a perspective detail view of a holding member 94.

In the manufacture of detonators it is necessary to determine their degree of sensitivity to the application of heat. This is of particular necessity when the detonators are of the type intended to be actuated by heat applied from a source external to the detonator. One example of the latter is a detonator containing lead azide, or lead azide and tetryl, and commonly interposed in an artillery ammunition projectile fuse between the end of the explosive delay train and the booster charge. It is necessary for the detonator to be sensitive enough to be actuated by the heat derived from the explosive delay train.

The present invention shows one form of a device by means of which detonators may be subjected to heat for test purposes.

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Referring to the drawings, there is a platform or base 2 made of iron or steel, or other suitable material, on the upper surface 4 of top member 5 of which are located a support 6 for a detonator, and a device 8 for producing and projecting burning gases or flame by means of explosion, the device 8 being designated herein as a flash producer or flame projector. The platform 2 has legs or supports 3.

The flash producer 8 has a vertical cylindrical housing or body 10. The housing 10 has a central cylindrical recess 12 having a lower reduced portion 14 and an upper enlarged portion 16. In the enlarged portion 16 is placed a rubber washer or gasket 18 having an outside diameter equal to the diameter of the portion 16 and an inside diameter equal to that of the reduced portion 14. Above the washer 18 is placed a metal disk 20 having a central bore 22 in which is placed a percussion primer 24. The bore 22 has its upper extremity 23 slightly enlarged to receive and support the rim of the primer 24 as shown. Above the disk 20 is placed a metal disk 26 having a central bore 28 in which is slidably located a firing pin 30 made of hardened steel and provided with a point at its lower end where it rests on top of the percussion cap 24 as indicated. The top of the firing pin 30 projects above the top of the flash producer 8 as shown. A closing plate or cover 32 is threaded to the reduced upper portion 34 of the housing 10. The cover 32 has a threaded recess 36 to engage the external threads 38 on the reduced portion 34 of the housing.

It is to be noted that the upper surface of the disk 26 projects slightly above the upper surface 40 of the housing 10, so that as the cover 32 is tightened downward, it serves to compress the gasket 18 tightly and also the rim of the primer 24 is pressed down tightly by the disk 26, thereby preventing gases from escaping out of chamber 14 by this path.

The cover 32 is provided with two diametrically opposite recesses 42 so that a wrench having two matching dowels or studs may be used to rotate the cover by inserting the dowels into the recesses and turning the wrench clockwise to tighten and counterclockwise to loosen it. The cover 32 may also be turned by applying a pipe wrench to its peripheral surface, in the usual manner for cylindrical surfaces. The cover 32 has a central aperture 44, through which the firing pin 30 protrudes.

A horizontal radial bore 46 connects the chamber 14 to the outside of the housing 10. The bore

46 has a reduced inner portion 48 and an enlarged outer portion 50, the portion 50 being threaded at its outer end 52. An annular copper gasket 54 having its inside diameter equal to that of bore 48 and its outside diameter equal to the diameter of bore 50, is located in the inner end of bore 50. A cylindrical member 56 having a central bore 58 with a reduced portion 60 and an enlarged portion 62 is located in bore portion 50 next to gasket 54 as indicated. The diameter of portion 62 of the bore 58 is equal to that of bore portion 48.

A hollow member 64 having external threads 66 is threaded into the threaded outer portion 52 of bore portion 50. The member 64 has a projecting portion 68 which is hexagonal in diametral cross section so it may be engaged with a hexagonal wrench for turning the member 64 into or out of engagement with the threaded portion 52. The member 64 has a frustro-conical shaped central opening 70, which expands outwardly as shown. By tightening member 64, the gasket 54 is compressed and the chamber 14 communicates with the outside of casing 10 through a flash passageway 55 comprising the bore portions 48, 62, 60, and opening 70.

A base plate disk 72 serves as a base for the housing 10 and is fastened to the underside of housing 10 by means of screws 74 passing through openings in the disk 72 and threaded into recesses 76 in the housing 10. Holes 78 in disk 72 enable the disk and housing to be removably secured to the top member 5 of platform 2 by placing the disk so the holes 78 fit over matching projecting studs or dowels 80 projecting upwardly from surface 4 and secured to the platform. The housing 10 is reduced in diameter at its lower end 82, the reduced end 82 fitting into a matching recess 84 formed in the upper surface of base plate 72.

The platform 2 has a central longitudinal elongated aperture or slot 86 formed through its top member 5. An L-shaped member or support 6 has a vertical leg 88 and a horizontal leg 90. In order to vary the distance of the support 6 from the flash producer 8, the horizontal leg 90 is provided with a lower horizontal elongated guide projection or tongue 92 which projects downwardly into the slot 86 and thus serves to constrain the support 6 to horizontal movement along the slot toward or away from the flash producer. To keep the tongue 92 from vertical motion, a member 94 is provided, a detail perspective view of it being shown in Figure 9. The member 94 has an upward projection 96 fitting into the slot 86 to a distance sufficient for its upper surface to touch the lower surface of tongue 92. The member 94 has a central vertical aperture 98 which is square in horizontal cross section. A bolt 100 having a round head 102 projects upwardly through the aperture 98, the shank of the bolt being square in cross section for a distance equal to the thickness of member 94, and of the same cross section as the aperture 98. The rest of the shank of the bolt 100 is round in cross section as it passes through a hole 104 in horizontal leg 90, and its upper end, protruding above hole 104 is threaded into a wing nut 106 by which the support 6 may be tightly secured in position at any desired point along slot 86.

The vertical leg 88 has an aperture 108 having its axis parallel to slot 86. A cylindrical member 110 extends into aperture 108, and has a collar 112 bearing against the surface of the

leg 88 around the aperture. A soft lead disk 113 equal in diameter to the outside diameter of member 110 as shown and about $\frac{3}{32}$ of an inch thick, is placed against the end 114 of member 110, closing it. A hollow cylindrical non-inflammable member 116, about one-sixteenth of an inch thick and having an inside diameter equal to the diameter of disk 113 extends over the disk and the end 114 of member 110, thereby holding the disk 113 against member 110. Member 116 has a reduced portion 118 equal in inside diameter to the outside diameter of the fuse 120 which is being tested and is inserted into the reduced portion 118 as shown. Cellulose acetate has been found to be a suitable material for making member 116.

As shown in the detail cross section of the fuse 120 in Figure 4, the fuse 120 comprises a hollow cylindrical casing 122 usually made of aluminum and has its open ends 123 and 125 reduced in the diameter of the openings by spinning or other suitable process. Inside one end 123 is located a very thin disk 124 made of aluminum foil about one thousandth of an inch in thickness, but the thickness may be greater or less depending on the specifications. The heat sensitive lead azide 126 is then placed inside the casing 122 and also, if desired, some tetryl 128. The thin disk 124 may be coated on its inside or outside surface with a seal coat and/or lacquer although the coating is omitted in some fuses. The fuse 120 is placed in the reduced end 118 with its end 123, containing the disk 124, facing toward the flash producer outlet 70. It is to be understood that this invention does not relate to the construction of the detonator 120 but rather to the means of testing of any detonators which it is desired to test for sensitivity to heat.

The operation of the device may now be described briefly. The cover 32 is removed from the flash producer 8 and the firing pin 30 and the two disks 20 and 26 lifted out. A small quantity 130 of a double base powder such as Ballistite, or a smokeless powder such as E. C. powder, is placed in the chamber 14 and a Western No. 3 percussion primer placed in the central opening 22 in disk 20 and then the cover, firing pin and disks are replaced, the cover being screwed on tightly. It is better to use Ballistite powder or an equivalent double base powder because it produces less slag particles as a residue and in the flame than smokeless powder. It was found undesirable to use more than 5 grains of Ballistite in the flash producer described above. A soft lead disk 113 is placed within the end of plastic member 116 having the larger diameter. The plastic member is then placed over the projecting end of member 110. A detonator 120 is inserted into the reduced portion 118 of the plastic member, the end 123 usually extending outward and facing the source of the flame. A weight is then dropped onto the projecting firing pin 30, setting off the primer 24 and exploding the charge 130. A flash of hot gases and flame resulting from the explosion of the charge shoots out through the flash passage 55 and the flash is projected against the detonator 120 being tested. If the heat reaching the contents of detonator 120 is sufficient and the detonator is otherwise sensitive, it will explode and cause a hole to be blown right through the soft lead disk 114. Thus the existence of such a hole in disk 114 indicates that the detonator 120 has exploded with a high order explosion, that is, a very rapid explosion amounting to detonation, while if no

hole exists in disk 114 but the detonator 120 has exploded, then this indicates a low order or relatively slow explosion not amounting to detonation.

The invention thus provides a device by means of which various types of detonators may be tested as to their sensitivity to heat in the form of a flash of flame, and in which the amount of flame reaching the detonator may be varied simply and conveniently.

Although the invention has been described in specific terms, it is to be understood that numerous changes may be made in the size, shape, arrangement and materials without departing from the scope and spirit of the invention.

I claim:

1. A device for testing a detonator, comprising a housing having a chamber formed therein for the reception of an explosive charge, means for exploding said charge whereby burning gases are produced in said chamber, outlet means whereby said gases may escape from said housing, and means for supporting a detonator in the path of said escaping gases.

2. A device for testing a detonator, comprising a housing having a chamber formed therein for the reception of an explosive charge, means arranged in said housing for exploding said charge whereby burning gases are produced, outlet means constructed and arranged for permitting said gases to escape from said housing, means for supporting a detonator in the path of said escaping gases, said means being constructed and arranged for varying the spacing between said detonator and said outlet means.

3. A device for testing a detonator, comprising a housing having a chamber formed therein for the reception of an explosive charge, means arranged in said housing for exploding said charge whereby burning gases comprising a flame are produced, outlet means constructed and arranged for permitting said flame to escape from said housing, means constructed and arranged for supporting a detonator in the path of said escaping flame, said means being constructed and arranged for varying the distance of said detonator from said outlet means.

4. A device for testing a detonator, comprising a support, a hollow housing having a chamber therein and constructed and arranged on said support for producing burning gases within said chamber, means constructed and arranged for projecting said gases out of said last named means, support means constructed and arranged on said support for supporting a detonator in the path of said projected gases, and means constructed and arranged for varying the spacing between said detonator support means and said gas producing means.

5. A detonator testing device comprising on a base, means constructed and arranged for producing and projecting a flame, and support means constructed for holding a detonator in the path of said flame, said support means being slidably arranged on said base and provided with locking means constructed and arranged for securing said support to said base at any desired point in said path, said support means having an upwardly projecting member having a horizontal aperture formed therein, a lead disk arranged over said aperture, closing the same, and means constructed and arranged for holding a detonator against the outer face of said lead disk, said disk and detonator being located on the side of said aperture nearest to said flame.

6. A device for producing a flash of flame for testing detonators, comprising a housing having a chamber formed therein for the reception of an explosive charge, means constructed and arranged in said housing for exploding said charge whereby burning gases comprising a flame are produced, outlet orifice means constructed and arranged for permitting said flame to escape from said housing, and nozzle means constructed and arranged for guiding said flame along a path outside said housing into contact with a detonator being tested.

7. In a device arranged on a base for testing detonators by applying a flash of flame from a flame producer to said detonators, a device for holding a detonator in the path of said flame, comprising an upwardly projecting member movably arranged on said base and provided with locking means constructed and arranged for securing said member to said base at any desired point in the path of said flame, said member having a horizontal aperture formed therein, a soft metal disk arranged over said aperture, closing the same, and means constructed and arranged for holding a detonator against the outer face of said metal disk, said disk and detonator being located on the side of said aperture nearest to said flame.

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REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
1,554,993	Ettele	Sept. 29, 1925
1,615,606	Wohler	Jan. 25, 1927
2,323,301	Anderson	July 6, 1943
2,377,425	Jackson	June 5, 1945