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EXPLOSION PROPAGATING DEVICE

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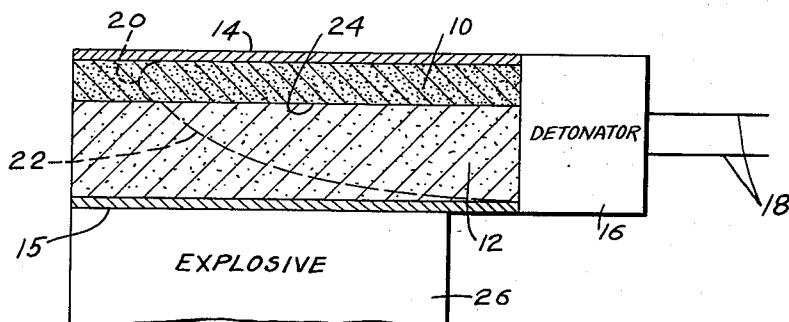


Fig. 1.

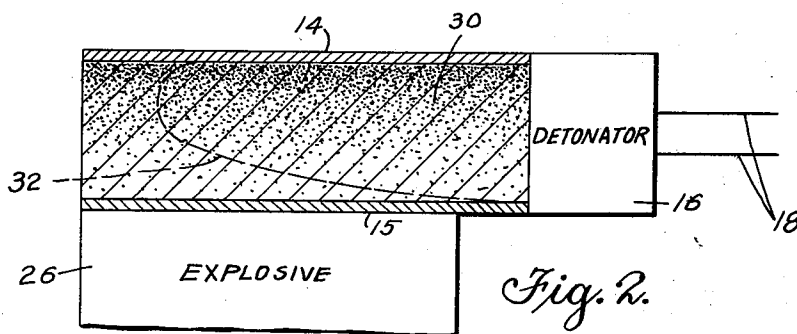


Fig. 2.

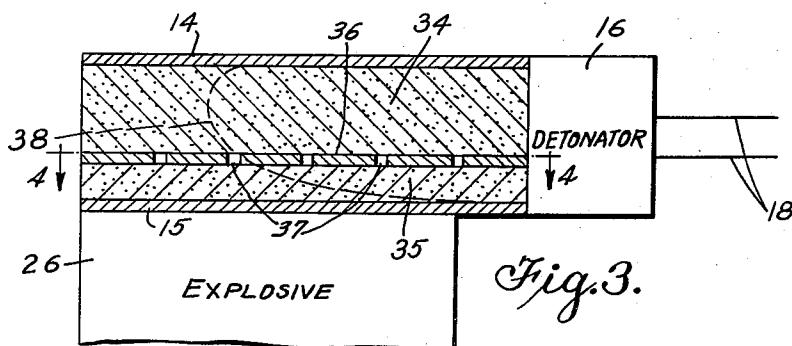


Fig. 3.

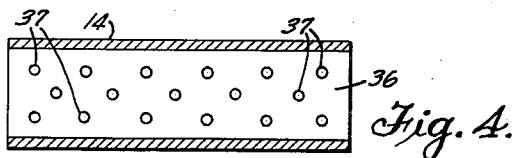


Fig. 4.

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EXPLOSION PROPAGATING DEVICE

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4 Claims. (Cl. 102—22)

(Granted under Title 35, U.S. Code (1952), sec. 266)

The invention described herein may be manufactured and used by or for the Government of the United States of America for governmental purposes without the payment of any royalties thereon or therefor.

This invention relates to explosives, and more particularly to a device comprising explosive material in sheet form designed to propagate a detonation wave in a special manner.

In some circumstances it is desirable to produce in explosive material a detonation wave of irregular form, wherein one portion of the wave front is retarded relative to another portion, with the result that as the detonation is completed the force thereof will be exerted not radially in the direction of propagation but at an angle thereto, and with greater brisance than would otherwise be the case.

In one form of the present invention a sheet of explosive propagating material is so formed that the material adjacent one surface has a faster rate of propagation than the material adjacent the opposite surface, with the result that as the detonation of the sheet is completed the force of the explosion will be exerted in the direction of the slower explosive and with a greater shattering effect than would be the case if the sheet were of homogeneous composition.

An object of the invention is to provide an explosion initiating and propagating device of the type above indicated, and which will be simple in construction and reliable in operation.

Other objects and many of the attendant advantages of this invention will be readily appreciated as the same becomes better understood by reference to the following description.

Fig. 1 is a view in cross-section of apparatus embodying the invention;

Fig. 2 is a cross-sectional view showing another form of the invention;

Fig. 3 is a similar view showing a third form of the invention; and

Fig. 4 is a fragmentary view taken on the line 4—4 of Fig. 3.

In Fig. 1, 10 designates a layer of explosion propagating material having a relatively fast rate of propagation, and 12 designates a layer having a relatively slow rate of propagation. The two layers may be protected by laminae or sheaths 14, 15 of relatively inert material such as molded nylon, cardboard, or metal, as disclosed in my copending application, Serial No. 255,129, filed Nov. 6, 1951, now Patent No. 2,774,306. Explosion of the two layers may be initiated by a detonator 16 placed at the edge of the sheet and controlled by electric leads 18. The resulting shock wave front in the layer 10 will have the general convex form indicated at 20, because of the known characteristic of explosive wave fronts to lag at the boundaries; i.e., where they are adjacent to air or other inert material. The wave front 22 in the slower explosive 12 will also be convex, but its upper portion will be advanced because the shock wave 20 imparts a portion of its force to the boundary 24 between the two explosives. The result will be as shown in the drawing, wherein the front 22 is so distorted as to approach a horizontal plane as the wave progresses, with the result that when the explosion is completed, the force thereof will be directed in a nearly downward direc-

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tion upon body 26, which may be a mass of high explosive or other material upon which a shock effect is to be produced. In effect, the layer 10 becomes the initiating layer, causing the detonation to strike downwardly and with greater brisance upon the mass 26.

In the form of the invention shown in Fig. 2, the single layer 30 of explosion propagating material is non-homogeneous, in that it is of faster composition adjacent its upper surface than adjacent its lower surface. This effect can be obtained by varying the ratio of high explosive to inert ingredients from a maximum at the upper surface to a minimum at the lower surface of the layer, or by adding a faster explosive ingredient adjacent the upper surface, or by adding a slower explosive or a retarding ingredient adjacent the lower surface. The resulting shock wave will be of the general form indicated at 32.

The form of the invention shown in Fig. 3 comprises upper and lower laminae 14, 15 as before, and upper and lower layers 34, 35 of explosion propagating material which are of identical and homogeneous composition but separated by a layer 36 of inert material which is formed with spaced perforations 37. These perforations 37 in the layer of inert material 36 may be cylindrical in form and shaped or staggered in rows as shown in Fig. 4. However, the upper layer 34 is substantially thicker than the lower layer 35, and this difference causes the shock wave in the upper layer to propagate at a higher rate than in the lower, thinner layer. This is in accordance with known characteristics of explosives, and produces a wave front of the form indicated at 38 in Fig. 3, which can be applied to an explosive mass in the same manner as described in connection with Fig. 1.

Obviously many modifications and variations of the present invention are possible in the light of the above teachings. It is therefore to be understood that within the scope of the appended claims the invention may be practiced otherwise than as specifically described.

What is claimed is:

1. Means for initiating an explosion in a mass of explosive, comprising a first layer of explosion-propagating material designed to be placed in contact with said mass, a second layer of relatively fast explosion propagating material overlying said first layer, said layers terminating in a common plane, and a detonator applied to said layers at said plane.

2. Explosion propagating device comprising a sheet of explosive material including two layers of different thickness, and a perforate layer of inert material between the layers.

3. An explosive device comprising a mass of explosive, a sheet of explosive overlying and contacting a surface of said mass and having a faster rate of propagation at its outer surface than at its surface adjacent said mass, and means for initiating detonation of said sheet at an edge thereof.

4. An explosive device comprising a mass of explosive, a sheet of explosive overlying a surface of said mass and having one face thereof in contact with said surface over a substantial area, the speed of propagation of the various particles of explosive in said sheet being a positive function of their distance from said face, and means for initiating detonation of said sheet at an edge thereof.

References Cited in the file of this patent

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