Sept. 28, 1937. A. LOWY 2,094,561

HAND GRENADE

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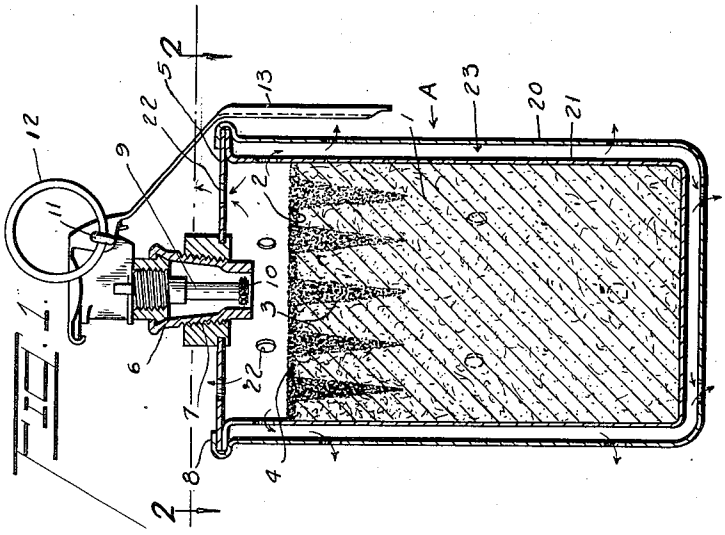


FIG. 1.

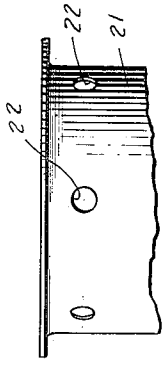


FIG. 4.

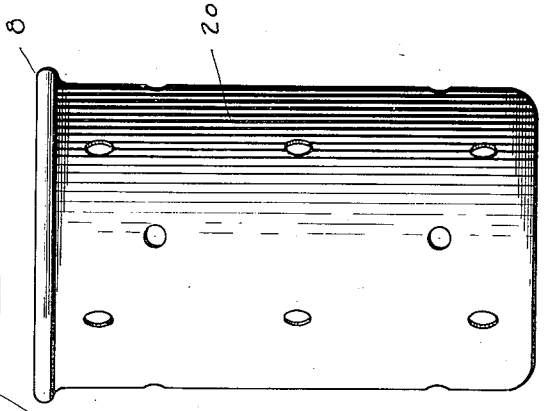


FIG. 3.

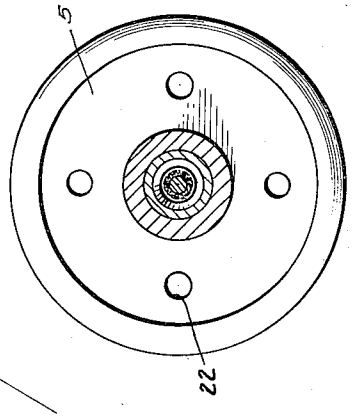


FIG. 2.

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FIG. 8.

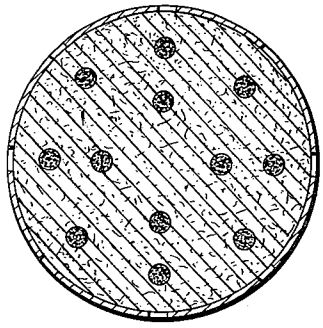


FIG. 6.

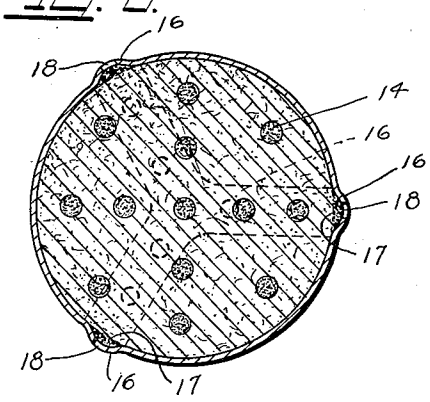


FIG. 7.

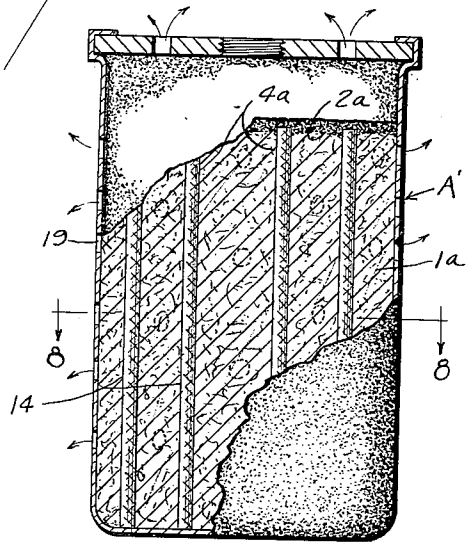


FIG. 5.

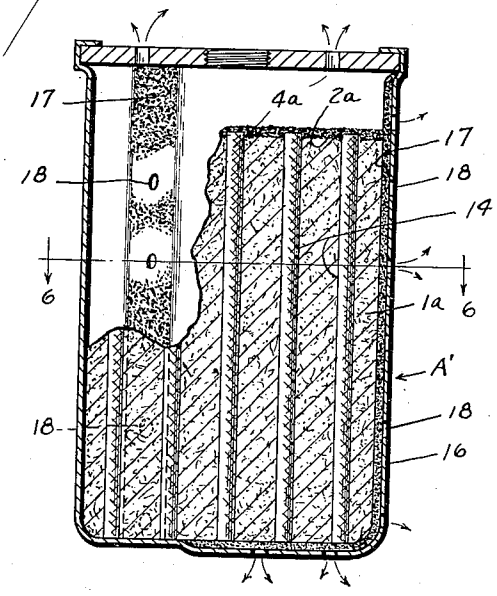
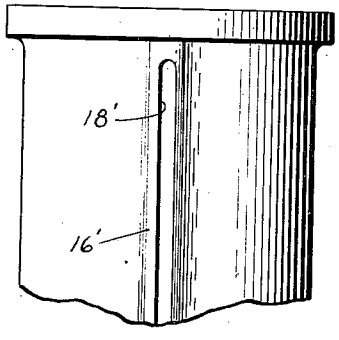


FIG. 9.



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HAND GRENADE

Alexander Lowy, Pittsburgh, Pa., assignor to Federal Laboratories, Inc., Pittsburgh, Pa.

Application September 19, 1934, Serial No. 744,731

5 Claims. (Cl. 102—29)

This invention broadly relates to hand grenades, but is particularly directed toward a gas emitting grenade, candles, bombs, and the like devised for the production of a smoke, a lachrymatory, sternutatory, toxic, lethal or similar irritating gas. This invention broadly consists of an improvement in a hand grenade of the type described in Ruben B. Lawrence United States Patent No. 1,620,475, the object of which is to provide means for increasing the combustion area or burning surface of the solidified mass of gas emitting material to thereby secure a greater concentration of gas per unit time.

The primary object of the present invention is to provide a container adapted for receiving a solidified mass comprising an irritating or toxic compound and a heat generating fuel, the said mass being formed with one or more depressions to provide if desired a combustion area greater than the cross sectional area of the container.

Another object of the present invention is to provide a sheet metal container having a plurality of longitudinally spaced openings for the emission of gases generated by ignition of the aforesaid mass from all sides of the container tending to make it unsafe for an attacked person to pick up the grenade and throw it back.

Another object of the invention is to provide a container having a corrugated cylindrical surface whereby there is afforded a grip by which the grenade may be better thrown as well as a plurality of inner channels or grooves within said container adapted to receive a relatively fast burning booster composition capable of fuse-like combustionable action thereby providing a greater burning surface for the aforesaid mass, These corrugations are extended to include the bottom of the container for the purpose last cited.

Another object of the invention is to provide a container having longitudinal disposed openings and a booster composition composed of "A", dust incorporated in collodion or nitrocellulose, or similar fuse-like compositions, whereby painting with said booster composition inside and/or outside of the containers will effectively seal said openings against the atmosphere and prevent resulting disintegration and decomposition of said mass by the atmosphere.

A still further object of this invention is to psovide in a device of the character described, inner and outer cylindrical apertured containers in spaced relationship to each other and having a top common to both, whereby a gas cooling and expansion chamber is formed between the walls of the said inner and outer container the purpose of which is to receive the evolved gases of the solidified mass prior to their admission to the atmosphere, whereby said gases are permitted to expand and cool to an appreciable extent and thereafter issue from the openings of the outer container at a temperature below that at which flashing or substantial decomposition of the irritant would occur on coming in direct contact with the atmospheric oxygen and thus rendering the dispersion of the gas highly efficient on all sides of the container. Thus the waste of irritant which would otherwise occur by chemical reaction or decomposition into compounds or compositions lacking the desired properties of the particular irritant or toxic gas is largely minimized.

Another advantage of this type of construction is that gas is emitted to the atmosphere from the top and all sides of the outer container thereby making it appear more hazardous to pick the grenade up and throw it to a secondary point.

An equally important object of this invention is the provision of a hand grenade of this character comprising a molded solidified mass of ignitible material adapted to emit gas upon ignition, forming the exposed surface of said mass with a plurality of pin pricks or small punched-out openings, applying a booster coating of readily ignitible material to said surface and filling said openings therewith to effect a thorough uniting of the booster and mass into a homogeneous composition and increasing the efficiency of the device without materially changing the horizontal plane surface of the solidified mass of the booster composition.

A further object is the provision of a hand grenade of this character comprising a solidified mass of ignitible material adapted to emit gas upon ignition, and a booster material placed thereon with a plurality of fuse-like extensions projecting into said mass, whereby said mass and booster are united into a unitary composition, separation thereof during handling prevented, and complete ignition of the solidified mass by said booster effected.

A further object of this invention is the provision of a hand grenade of this character comprising a solidified mass of ignitible material adapted to emit gas upon ignition, a plurality of independent fuse members embedded in said mass with their upper ends projecting beyond the exposed plane surface thereof, and a booster material applied to said exposed surface and covering said fuses, whereby said mass, booster and fuses are firmly united into a unitary structure, and said booster adapted to ignite said mass and fuses to effect complete ignition of said mass.

With these and other objects in view, which will become apparent as the description proceeds, the invention resides in the construction, combination and arrangement of parts, hereinafter more fully described and claimed, and illustrated in the accompanying drawings, in which like characters of

reference indicate like parts throughout the several figures, of which:

Figure 1 is a detailed longitudinal sectional view of a grenade forming the subject matter of my invention.

Figure 2 is a part sectional top plan view of the container taken on the line 2—2 of the housing of the bouchon of Figure 1.

Figure 3 is a detail side elevation of the outer apertured container illustrated in Figure 1.

Figure 4 is a fragmentary detail inside elevation of the inner apertured cylindrical container illustrated in Figure 1.

Figure 5 is a detailed longitudinal sectional view of a modified form of container incorporating inner channels for receiving the booster mix therein and fuse-like elements extending into the solidified mass.

Figure 6 is a sectional view taken on the line 6—6 of the container shown in Figure 5.

Figure 7 is a detailed longitudinal sectional view of a further modified form of container with the booster mix applied to the inner and/or outer surface of the container.

Figure 8 is a sectional view taken on the line 8—8 of the container shown in Figure 7.

Figure 9 is a modified form of the container shown in Figure 5.

Briefly the grenade preferably comprises a container of sheet metal or other suitable material in which a body of solidified material is placed with its upper plane surface spaced from the upper end of the container, said surface being formed with a plurality of pin pricks, punch holes or the like, a suitable booster material applied to said surface and filling said holes, whereby said materials are interlockingly merged, the portions of the booster material within said holes constituting fuse-like elements, an igniter with safety means therefor to prevent accidental setting off of the grenade, one or more gas openings in the container having pressure removable closures, said closures being effective for sealing the ignitible material from outside conditions, yet not requiring their removal to set the grenade in operation.

In the illustrated embodiment characterizing this invention there is shown a metal container A having a solidified mass 1 of ignitible material positioned therein and which may consist of any substances suitable for the desired purpose. If tear gas is to be produced a mixture of chloracetophenone may be preferably employed, said mixture giving off a very concentrated lachrymating gas when heated, the powder upon ignition furnishing sufficient heat for the purpose. The two may be formed into a solidified mass in the container by mixing them with acetone, tamping the mass into place and allowing the acetone to evaporate. It is apparent that different gas producing substances may also be added and when liberated as a composite gas adapted to produce different incapacitating effects, as desired.

The exposed plane surface 2 of the solidified mass 1 within the container A is formed with a plurality of pin pricks or punched openings 3 extending within said mass. A suitable booster coating material 4 of black powder or the like is applied to said surface 2 and adapted to fill said holes 3 to insure complete ignition and effect an interlockingly merged binding relation between the mass and booster.

Practice has demonstrated the difficulty of maintaining the booster material in complete contact with the ignitible mass during handling of the device and which has tended to materially decrease its efficiency, and it was to overcome such disadvantages, that I designed the above means of uniting the booster 4 and ignitible mass 1 into a homogeneous composition by means of dovetailing, as it were, the two compositions and providing an exposed surface combustible area, without materially depleting the ignitible mass 1 and without destroying to an appreciable extent the normal horizontal exposed surface thereof, or of the booster, at the same time, increasing the ignitible effect of booster 1 by virtue of the booster 4 filling the holes 3, in effect constituting fuse elements and increasing the ignitible area of the booster to insure complete ignition of mass 1, as will be clear without further discussion.

The uniting of the booster and mass 1 may be further effected by mixing the booster with collodion and acetone prior to its application to said exposed surface 2 and which likewise produces a glazed surface for the booster material 4 and constituting a protective coating therefor.

A housing 6 of a firing mechanism or bouchon is threadedly maintained in closure 7 preferably secured to the container A by crimping the edge portion of the container A thereover as at 8. This firing mechanism is of standard construction and comprises the bouchon having the fuse 9 which has the end tip 10 consisting of a paste similar to the booster 4.

In operating the grenade the pin 11 is withdrawn by pulling the ring 12. The strap 13 is then released and flies off which permits the firing mechanism to function, thereby igniting the fuse 9. The fuse, which is preferably a time fuse, after the predetermined delay ignites the tip 10 which in turn ignites the booster 4.

The closure 5 is formed with gas openings 22 which may be normally sealed by the booster composition, paper, tape or paraffin plugs or the like, and which while sealing the material in the grenade from outside conditions are readily blown off by the pressure generated when the grenade is set in operation.

When the grenade is set off as above described it is then thrown, the fuse being timed to ignite the powder ball in a predetermined time interval of seconds as desired. As the latter burns it ignites the booster coating 4 and the solid gas producing material immediately begins to emit gas in quantities as and for a purpose well understood.

It will be noted that the firing mechanism may be removed as a unit and also if desired the cover may be removably secured to said container without departing from the scope of the invention.

From the above it is apparent that the invention constitutes an improvement over devices of this general character by providing a means thoroughly uniting the booster material and the ignitible mass, overcoming the disadvantages incident to their separation during handling, said means likewise increasing the ignitible efficiency of the booster and insuring complete ignition of the ignitible mass and liberation of its gaseous properties for the purpose intended. Also, the above is effected without materially depleting the mass, thereby permitting utilization of a maximum quantity of the solidified mixture.

In Figure 5 and Figure 7 there is shown a slightly modified form of grenade substantially to the form above described, showing a slightly different manner of uniting the booster material to the solidified mass and interlocking fuse struc-

ture. In the latter form there is shown a container A', solidified mass *1a*, having an exposed plane surface *2a*, and embedded in said mass with their upper ends extending slightly beyond surface *2a* are a plurality of independent fuses **14** and a booster ignitible material *4a* suitably applied to the surface *2a* embedding the upper ends of said fuses **14** therein, said booster presenting an exposed plane surface adapted to be ignited by a firing mechanism similar to the form above described. Said fuses **14** not only constitute interlocking binding elements to effect the rigid uniting of the booster and solidified materials but are adapted to increase the ignitibility of mass *1a* by booster *2a*, thus effecting rigid connection and complete ignition of said mass *1a*, as will be clear without further discussion.

There is shown in Figure 6 a cross section of the cylindrical container having a plurality of corrugations **16** which may be adapted to receive one of the fuses **14** or as I now prefer in my present practice a coating **17** of the booster material *2a*. Obviously any number of corrugations may be provided, as desired, although I have herein shown three, as present practice and existing material indicate that it serves the desired purpose. The corrugations **16** may be disposed transversely of the longitudinal axis of the container but in accordance with present practice I prefer to dispose them parallel to each other and to the longitudinal axis of the container because such latter disposition affords a better hand grip for throwing the grenade. The corrugations **16** are provided with spaced openings **18**, as shown in Figure 5, or with elongated slotted openings **18**[1], extending substantially the entire length of the corrugations **16**[1], as illustrated in Figure 9. The painting of the corrugations with the booster mix serves to effectively seal the openings **18** to the atmospheric air.

There is shown in Figure 7 a cross section of a cylindrical container constituting a modification of that shown in Figure 5 wherein a similar function is obtained by coating the entire inner surface with booster material *4a* and if desired to more effectively seal the openings **19** thereof, the booster material may in like manner be painted on the outside. I have found in practice that the outer coating will be immediately ignited through the openings **19** and thereby serves to increase the surface heat of the container and further prevent its being picked up and thrown back at the attacker.

I have found it desirable in producing high concentrations of lachrymatory, sternutatory or toxic gases and particularly in combinations of lachrymatory and smoke (fog) creating gases to provide an expansion or cooling chamber such as is particularly illustrated by the inner and outer containers of Figure 1, wherein **20** represents an outer container duly apertured but unsealed against the atmosphere, and **21** represents an inner container in spaced relationship to the said outer container, apertured at points above the surface of the solidified mass **1** as specifically illustrated in Figure 1 and Figure 4 by the numeral **22**, which apertures are duly sealed against the atmosphere by tape, paper, paraffin, or other well known operative sealing means. By reason of the aforesaid provisions the gases are emitted from the openings in the inner container **22** to the annular cooling or expansion chamber **23** formed between the inner and outer walls **20** and **21** which serves to effectively cool the gases before they are admitted to the oxygen of the atmosphere, thereby preventing a flashing and consequent disintegration of the gaseous material, which would normally exist if high concentrations were admitted directly to the atmospheric oxygen.

Having described my invention what I now claim as new and desire to secure by Letters Patent is:

1. In a device for generating an incapacitating gas comprising in combination a corrugated container having longitudinally disposed openings in said corrugations, a solidified substance of ignitible gas emitting material, means supported by said container for igniting said solidified substance, a fuse-like booster composition covering the normally exposed top surface of said solidified substance and filling the grooves formed by the corrugations in said container and normally sealing said longitudinally disposed openings to the atmosphere.

2. In a device for generating an incapacitating gas, comprising in combination a corrugated container having elongated slotted openings in said corrugations, a solidified substance of ignitible gas emitting material, means supported by said container for igniting said solidified substance, a fuse-like booster composition covering the normally exposed top surface of said solidified substance and filling the grooves formed by the corrugations in said container and normally sealing said elongated slotted openings to the atmosphere.

3. In a device for generating an incapacitating gas, comprising in combination a container, a solidified substance of ignitible gas emitting material, a booster substance, a fuse-like booster composition uniting said solidified substance and said booster substance to form a coherent mass, and means associated with said container for the ignition of said coherent mass, the said container being characterized by comprising inner and outer apertured casings in spaced relationship to each other forming therebetween a cooling and expansion chamber for the gases emitted by said mass prior to their contact with atmospheric oxygen.

4. In a device for generating an incapacitating gas, comprising in combination a corrugated container having openings in said corrugations, a solidified substance of ignitible gas emitting material, means supported by said container for igniting said solidified substance, a fuse-like booster composition covering the normally exposed top surface of said solidified substance and filling the grooves formed by the corrugations in said container and normally sealing said opening to the atmosphere.

5. In a device for generating an incapacitating gas, comprising in combination inner and outer apertured containers, a solidified substance of ignitible gas emitting material in said inner container, a common closure for the inner and outer container, means supported by said common closure and spaced from said substance for igniting the materials thereof, and a booster composition adjacent to and in ignitible contact with said means.

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