Aug. 30, 1966 W. G. WILLMANN ETAL 3,269,313

SELF-PROPELLED SUB-MUNITION

Filed Jan. 18, 1965

Fig. 2

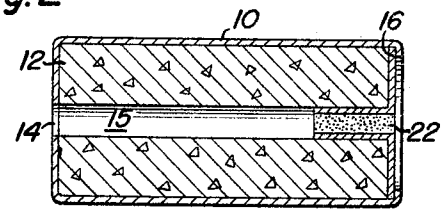


Fig. 1

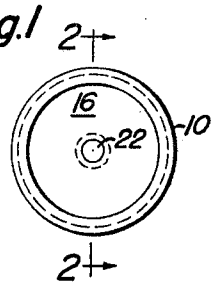


Fig. 4

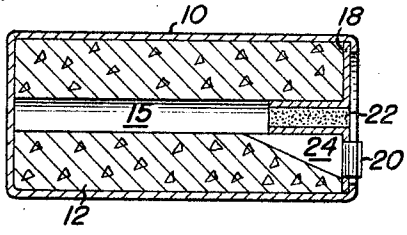


Fig. 3

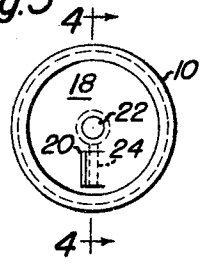


Fig. 5

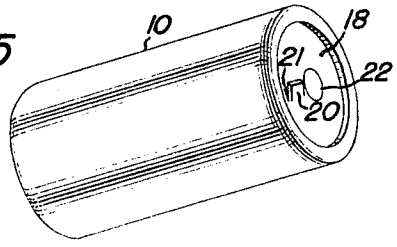


Fig. 6

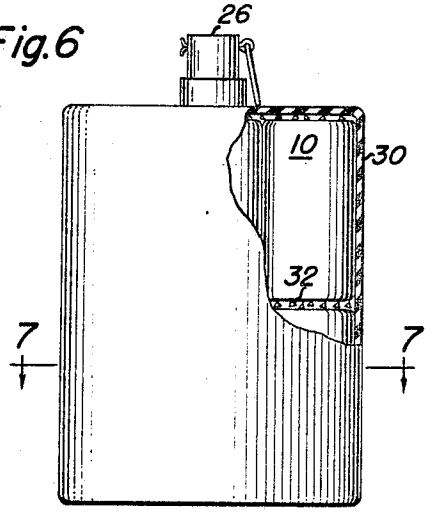
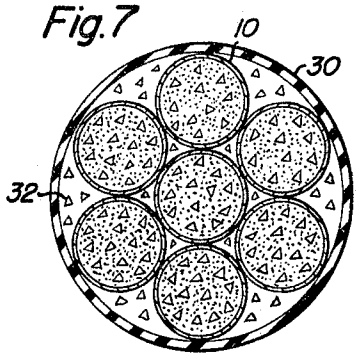


Fig. 7



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United States Patent Office 3,269,313 Patented August 30, 1966

3,269,313

SELF-PROPELLED SUB-MUNITION

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Filed Jan. 18, 1965, Ser. No. 426,454
5 Claims. (Cl. 102—49)

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 to us of any royalty thereon.

The present invention relates generally to gas dispersing apparatus adapted to disperse incapacitating agents. An object of this invention is to provide apparatus which disseminates the agents to a central spot whereby they disperse further by the power developed within the device itself. A further object of the present invention is to provide self-dispersing sub-munitions which go in a straight line along the ground and some of which follow a circular pattern along the ground.

The principal advantage of the present invention lies in the fact that these sub-munitions can be used in riot control work whereby the people towards which they are directed will be unable to throw the munitions back in the direction they came from. This results from the fact that once these sub-munitions are carried to the designated target and dispersed, they slide along the ground with great velocity and are difficult, if not impossible, to catch and throw back. In addition to this fact, the metallic container which holds the agent and combustion mixture becomes extremely hot and cannot be handled in the bare hands.

It is known that sub-munitions of this type can be made of heavy cardboard which will rupture after a predetermined time on the target and prevent the return of the sub-munition. Other devices are known in which a grenade separates into several sections upon arrival in the target area. These devices have the advantage of dispersing the incapacitation agent over a wide area. They also make it difficult for the people in the mob to find and return any or all of these small sections. However, our device has the added advantage of not only breaking up into a multiplicity of point sources of incapacitation agent but they also have the ability to move by themselves at a fast rate of travel. This advantage improves the dispersion pattern to a great extent and further prevents anyone from picking up and throwing these bomblets back to the original delivery point.

These advantages and objects will be apparent from the following description and claims when taken in connection with the accompanying drawings wherein—

FIGURE 1 is an end view of one form of the invention;

FIGURE 2 is a cross-sectional view of the form shown in FIG. 1 taken on section 2—2;

FIGURE 3 is an end view of another embodiment;

FIGURE 4 is a cross-sectional view of the form shown in FIG. 3 taken on section 3—3;

FIGURE 5 is an isometric view of the embodiment shown in FIG. 3;

FIGURE 6 is a partially sectionalized rubber hand grenade incorporating our self-propelled sub-munitions;

FIGURE 7 is a cross-sectional view of FIG. 6 taken on section 7—7;

Referring now to the drawings:

The cylindrical container or sub-munition is preferably made of aluminum or steel. The combustion mixture of chemical agent and incendiary agent is shown at **12**. The end of the container **10** in FIG. 1 has an exhaust port **14** which is in alignment with an axial bore **15**.

It is preferred to have the container formed with one integral end piece and one assembled end piece **16** in

FIG. 1. However, it is possible to have two assembled end pieces. The top or end piece **16** contains a delay mix **22** whose composition will be elaborated on below.

FIGURE 3 discloses a modified form of the device shown in FIGURE 1. In this modification, the top **18** is provided with a side tab **20** which acts as a deflector for the hot gases issuing from the funnel slot **24** and the exhaust port **21**. The design of slot **24** is fully apparent when FIG. 3 and FIG. 4 are compared. Thus, it is evident from FIG. 3 that the slot **24** communicates with the central bore **15** and from FIG. 4 that the slot **24** is relatively narrow.

FIGURE 5 is an isometric view of the device shown in FIG. 3 and illustrates the fact that the side tab **20** is at an angle of approximately 45 degrees to the plane of the top or end piece **18**. The exhaust port **21** is located closely adjacent to and directed toward the side tab **20**.

In FIGURE 6 we have illustrated one possible way our sub-munitions could be delivered to the target area. In this illustration, **26** is a conventional hand grenade fuze of the type illustrated in U.S. Patent No. 2,203,640. In this figure, **30** is the rubber container which holds the munitions in place until the ignition of the dispersing material inside the rubber body takes place. In FIGURE 7 we have illustrated the nesting of the sub-munition inside the container **30** with the dispersion mixture **32** packed around them.

In operation, the sub-munitions are carried to the target area in a suitable container. In FIGURES 6 and 7 we have illustrated one such delivery device. Obviously, other delivery devices will occur to persons skilled in this art. For example, rocket devices of the type illustrated in Patent No. 2,112,758 may be used in lieu of a rubber hand grenade illustrated in FIGURES 6 and 7. When the nest of sub-munitions arrive on the target they are dispersed by initial bursting charge. This is illustrated in FIGURES 6 and 7 by the dispersion charge **32**. This charge breaks open the frangible container **30** and disperses the sub-munitions or containers **10** over a relatively large area, the flame from the dispersion mixture **32** simultaneously ignites the delay mix **22** whereupon after a predetermined time interval the flame from this delay mixture reaches the combustion mixture **12** which is packed inside the bomblet **10**. When this mixture is ignited, the gases issuing from the nozzle **14** or the nozzle **21** leaves the container **10** with great thrust. This thrust imparts a high velocity to the container **10** in the opposite direction so that the container **10** is pushed along the ground for a relatively long period of time. Thus, the dispersion pattern of our sub-munitions is greatly increased over the conventional devices since we provide a multiplicity of small sub-munitions each going in different directions on the ground and each releasing a chemical agent as they go along the ground. We further provide a sub-munition as illustrated in FIGURE 3 wherein the issuing gases are deflected by the side tab **20** which imparts a turning moment to these sub-munitions. Thus, the sub-munitions incorporating the side tab or deflector **20** do not go in straight lines but describe wide arcs on the ground. Obviously, the sub-munitions above described can be mixed or matched in the delivery vehicle **30**, so that the most desirable dispersion pattern may be obtained.

The delay mixture **22** is a special delay mixture comprising 15 to 20 percent of silicon mixed with 80 to 85 percent of red lead. This delay mixture has the property of propagating the fire or flame front and at the same time sealing the chamber in which it is packed after the flame passes through. Thus, in the sub-munitions disclosed by us, after the delay mix **22** is ignited the hole is completely sealed whereby the exhaust gases from the combustion mixture **12** must go out the exhaust ports **14** or **21**.

The dispersion charge or mixture **32** can be a standard

black powder and any other equivalent low grade explosive powder.

Our sub-munitions have been designed to use a specific chemical agent-pyrotechnic mixture. The chemical agent we have used is a new type of riot control agent known as o-chloro benzal malononitrile. It is known that the concentration of one part in ten million of o-chloro benzal malononitrile is as effective as a concentration of one part in a million of chloro acetophenone. The use of o-chloro benzal malononitrile is described in the patent application of David Crichton et al., Serial Number 51,134, filed August 22, 1960, entitled Apparatus for Controlling Riots. This case is now abandoned. We take the above chemical agent and mix it with a combustion mixture according to the following formula:

	Percent
o-Chloro benzal malononitrile	40
Potassium chlorate	27
Sugar	18
Magnesium carbonate	12
Cellulose nitrate	3

The above mixture is compressed in the sub-munitions using a ram under 1200 pounds per square inch. The ram has a central pin which provides for the central bore **15**. In the case of FIGURE 3, the ram has a sloping fin which provides the funnel slot **24** after the composition is rammed in place.

Obviously, this invention can be applied to other agents such as chloro acetophenone, bromo acetophenone, iodo acetophenone, etc. However, when using different agents there must be a modification of the combustion mixture to provide the proper burning time. We have found that a ten second burning time with about three pounds per square inch internal pressure in the sub-munitions provides the ideal conditions under which these devices will operate.

Other modifications of the invention can be made by those skilled in this art. The present invention is not limited to the details set forth in the foregoing specification, but must be limited only by the following claims.

We claim:

1. A self-propelled sub-munition comprising:
(A) cylindrical container means,
(1) exhaust port means in one end thereof,
(2) fuze means in one end thereof,
(B) agent-combustion means filling said container except for an axial bore, which is communicative with said port means,
(1) said means comprising a major portion of combustion means for skiddingly propelling said container randomly across the ground, mixed with a minor portion of agent means.

2. A self-propelled sub-munition comprising:
(A) a cylindrical container having first end plate means and second end plate means spaced a predetermined distance apart,
(1) said first end plate means being provided with a centrally disposed exhaust port means,
(2) said second end plate means being provided with fuze means,
(B) compacted agent-combustion means for skiddingly propelling said container randomly across the ground, substantially filling said container,
(1) said means having an axial bore therein communicative with said port means,
(2) said means comprising a mixture of a major portion of fuel and oxidizer means with a minor proportion of a vaporizable organic active agent.

3. A self-propelled sub-munition comprising:
(A) cylindrical container means having first end plate means and second end plate means spaced a predetermined distance apart,
(1) said first end plate means being provided with,
(a) radially disposed exhaust port means,

(b) deflector means mounted adjacent to said port means,
(c) axially located fuze means,
(B) compacted agent-combustion means filling said container except for an axial bore,
(1) said means comprising a major portion of combustion means for skiddingly propelling said container randomly across the ground, mixed with a minor proportion of agent means,
(2) said means having slot means interconnecting said port means and said bore.

4. A self-propelled sub-munition comprising:
(A) a cylindrical container having an integral end plate and an assembled end plate mounted at the opposite end thereof,
(1) said integral end plate being provided with a centrally disposed exhaust port,
(2) said assembled end plate being provided with a centrally disposed self-sealing fuze of predetermined burning time,
(B) a compacted agent-combustion mixture for skiddingly propelling said container randomly across the ground, filling the major portion of said container,
(1) said mixture having an axial bore therein in alignment with said exhaust port and said fuze,
(2) said mixture comprising a major portion of a fuel and oxidizing agent with a minor portion of a vaporizable organic active agent.

5. A self-propelled sub-munition comprising:
(A) a cylindrical container having an integral end plate and an assembled end plate having an exhaust port, mounted therein,
(1) said assembled end plate being provided with a centrally disposed self-sealing fuze of predetermined burning time,
(2) said assembled end plate being further provided with an outwardly angled, radially extending rectangular side tab adjacent to said exhaust port,
(3) said exhaust port and side tab being located a predetermined radial distance from the axis of said container,
(B) a compacted combustion mixture for skiddingly propelling said container randomly across the ground, filling the major portion of said container,
(1) said mixture having a central axial bore therein adapted to receive said fuze and having an axially extending slot therein on the end adjacent to said exhaust port and providing communication between said port and said bore,
(2) said mixture comprising a major portion of a fuel and oxidizing agent and a minor portion of a vaporizable organic active agent.

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