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(54) **SMOKE HAND GRENADE**

RAUCHGANDGRANATE

GRENADE FUMIGENE A MAIN

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Description

Field of the invention

[0001] The present invention relates to an arrangement for spontaneously establishing a smoke screen specifically for self screening of the individual soldier. More specifically, the invention relates to an arrangement in a smoke hand grenade comprising a container which per se holds a liquid smoke material.

Background of the invention

[0002] The present invention is developed in connection with rapid self screening of the visible and proximity infrared spectral range of a soldier in a critical combat situation.

[0003] Existing smoke hand grenades are based on combustion of a pyrotechnical composition for generating a relatively toxic smoke which substantially comprises zinc chloride. By unprofessional use of this smoke deaths have occurred. Several userlands within NATO have therefore a desire to exchange this type of smoke when a smoke can be provided which is less poisonous and preferably just as effective. It is expected that the smoke thus will not comply with the environment requirements to which smoke ammunition will be subjected in the future. Further, this type of smoke has a limited application during training in dry vegetation since it can cause fire.

Prior Art

[0004] GB-A-1 149 982 (preamble of claim 1) discloses a shell comprising inter alia a metal casing wherein a liquid smoke material is absorbed in a powder (calcium silicate, neutral) and is located in the cavity of the grenade.

[0005] In a training field with extensive use of smoke grenades this will imply that the environment will be subjected to unwanted large stress. This is not in compliance with today's user requirements. The grenade according to said GB publication will generate an environment hostile smoke as the powder into which the liquid smoke has been absorbed, is scattered on the ground onto which the grenade lands, which will render acidic fallout which cannot be neutralized. Consequently, this principle will today not be applicable in a novel smoke grenade for the army.

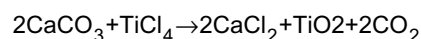
[0006] The suggested subject matter of the invention is a hand grenade in PCDF (plastics). The liquid smoke which is in its own room in the grenade, will react with the moisture of the air after the bursting and emit hydrochloric acid as a by-product. In order to neutralize this there is in its own, separate compartment around the inner container, located for example Dolomite, Ca Mg (Co₃)₂ (the same material which is used for example for neutralizing acid in precipitation (fishing waters)). This

powder will be scattered on the ground after the bursting and neutralize the liquid smoke which falls out in the area around the bursting point.

Brief disclosure of the invention

[0007] An object of the present invention is aiming for providing a rapidly functioning smoke hand grenade which is substantially less poisonous than present smoke hand grenades based on zinc chloride smoke (ZnCl₂) (HC-smoke). The smoke material according to the present invention is titanium tetrachloride (TiCl₄ abbreviated TTC). Besides, the toxicity of smoke based on hydrolyse of TiCl₄ is very low. If one anticipates that mortal concentration of ZnCl₂-smoke is C_D, one will even with a TiCl₄ smoke concentration which is 5 x C_D, only find minor harmless changes in the lung tissue (ref Karlsson et al., 1986, Archives of Toxicology).

[0008] Further, the smoke grenade is to be favourable for the environment, i.e. it should in sum not be specifically pollution and acid promotional on the environment. This objective is achieved by including calcium powder in the smoke canister in a stoichiometric relation of the hydrochloric acid which is given off by hydrolyse of TTC during the generation of smoke. The total reaction is:



[0009] The reaction products calcium chloride (CaCl₂) and titanium dioxide (TiO₂) are compounds which do not have a negative influence on the natural environment.

[0010] A preferred aspect of the invention is that the calcium layer in the container around the inner compartment containing the liquid smoke, will neutralize the liquid smoke which diffuse through the plastics out from the inner container. Without this layer which thereby is quite substantial for the grenade, the liquid smoke/hydrochloric acid would be released and would influence the environment in the storage. More than 10-15 years in a stand-by storage would involve unacceptable corrosion of other storage material.

[0011] Contrary to mixing liquid and powder, as suggested by the prior art, it is according to a preferred aspect of the invention suggested to hold the liquid smoke in a separate inner chamber, a fact which renders substantial advantages compared with the prior art, both as regards storage and use.

[0012] Possibly, the firing mechanism of the grenade could be replaced by a metal insert equipped with a blasting cap and an ejector charge, so that the smoke canister can be fired from an appropriate discharge pipe, for example for screening battle field vehicles.

Brief description of the drawings

[0013] Fig. 1 is a view partly in section of a smoke

hand grenade, standard version, according to the invention.

[0014] Fig. 2 is a view partly in section of an alternative construction of the smoke grenade according to the invention.

[0015] Fig. 3 is a section through a smoke canister which by removing the bottom plug (B) in standard version or in alternative version of the smoke hand grenade, can extend the screening time for the smoke hand grenade by letting the canister remain on the ground and give off smoke in approximately 20 seconds after the instantaneous part (Fig. 1 or Fig. 2) has burst and given off smoke.

[0016] Fig. 4 is a section through a module which can replace the ignition mechanism for the hand grenade by being screwed therein in a simple manner, and thereby transfer the smoke hand grenade to a smoke ammunition which can be fired from an appropriate discharge pipe.

Detailed description of embodiments

[0017] As appearing from Fig. 1 there is used a hand grenade in a known manner by holding the same in the right hand, whereafter the pulling ring 1 with the safety bolt 2 is pulled out and the grenade is thrown. A spring loaded striking arm having an ignition pin will strike against a blasting cap which ignites a delay charge which when being burned out (approximately 3 seconds) thereafter will fire the bursting charge 7 in the centre pipe, whereby the canister is burst and scatters the smoke material 9 and the acid neutralizing material 8. This will be scattered on the ground under the bursting point and will neutralize the hydrochloric acid from the liquid smoke falling on the ground.

[0018] In Fig. 2 there is illustrated part of a section through a variant of the smoke hand grenade, the latter comprising an outer pipe and a centre pipe including a container of shatter-proof glass which is arranged around the centre pipe, and which contains the liquid smoke, and wherein the acid neutralizing material fills up around the glass container. By reaction in the trajectory the glass container and the canister is broken by the pressure from the bursting charge when this is fired, for thereby scattering smoke and the acid neutralizing component.

[0019] Fig. 3 illustrates a section through a smoke canister which the smoke hand grenade according to Fig. 1 and Fig. 2 can be equipped with, by removing the plug 12 and screwing the attachment plug 17 into the bottom. Upon throwing, the bursting charge will be fired in the trajectory and the heat from the charge will fire the ignition conveyor in the attachment plug 17, which immediately will send a flame tongue into the ignition charge 21, which for example can be a thermite mixture, and which burns through the sleeve around the ignition charge and fires the surface of the smoke charge, preferably as a pyrotechnical charge, whereby the smoke

gas escapes through the smoke channels 20 in the the charge and out through the holes 22 in the bottom of the canister. The canister will lay on the ground and burn whilst continuously releasing smoke in 20-30 seconds.

[0020] It will be up to the user to decide whether the canister according to Fig. 3 should be included in the smoke hand grenade in view of the increased price entailed therewith.

[0021] Fig. 4 illustrates an insert or module which can be screwed into the smoke hand grenade instead of the ignition mechanism 3, whereby the canister can be fired from its own discharge pipe equipped with a centre blasting bolt and an inner diameter which is adapted to the canister. The field of application can be training smoke for armoured vehicles wherein the original pipes for discharging smoke are equipped with insert pipes which have been adapted to the modified smoke hand grenade.

[0022] Upon application the pipes are firstly loaded and thereafter fired from the vehicles by pressing the discharge button for the smoke, whereby through a not specified reaction chain, the blasting bolt in the insert pipe will strike against the blasting cap 23 which ignites the conveyor 24 which in turn fires the ejector charge 26, whereby the hot combustion gases blow out through the holes 25 in the rear element and eject the canister, at the same time as the heat from the combustion also will ignite the delay unit 27 which after approximately 1 second will fire the bursting charge 28 so that the canister is bursting in the air as previously described, for generating an instantaneous, environment favourable smoke screen approximately 20 metres from the vehicle. The smoke material in the previously discussed smoke hand grenades or canisters, is titanium tetrachloride TiCl_4 .

[0023] The acid neutralizing material can be calcium CaCO_3 , ammonia (30-35%) in water or an aliphatic amine or some other acid neutralizing compound.

[0024] Preferably, the titanium tetrachloride can be present as a liquid phase, this liquid by contacting the moisture of the air spontaneously reacting for generation of white smoke. The heat dissipation by this reaction is relatively small. Consequently, there exists no danger for putting the vegetation on fire by using this smoke material, if the smoke canister of Fig. 3 is not attached to the smoke hand grenade.

[0025] In a canister dissipating smoke from the ground there will preferably be used a pyrotechnical smoke charge. This can give off TTC smoke or HC smoke if one reduces the requirement regarding toxicity.

[0026] The elements of the smoke hand grenade can appropriately be injection moulded plastics material (for example PV-DF). The bottom including pipe can be injection moulded in one member and the lid in a second member. The lid can appropriately be added to said first member by ultra sonic welding, see Fig. 1, reference numeral 8.

[0027] The shatter-proof, double-walled glass con-

tainer illustrated in Fig. 2, can easily be manufactured by letting the glass pipe which is to constitute the wall towards the centre pipe of the container, be arranged in a second glass pipe having a diameter corresponding to the outer diameter of the glass container, whereafter the pipes are welded against each other at the ends thereof, with a successive curing. Thereafter, there is attached a smaller inlet pipe by welding, which after filling of TTC is closed by fusing.

Claims

1. Arrangement in a smoke hand grenade comprising a container which per se holds a liquid smoke material,
characterized in that the container which holds the liquid smoke material (9a), is separated from a composition (8a) which after bursting neutralizes the acid by-products being formed after the liquid has reacted with the air moisture whilst emitting smoke.
2. Arrangement as claimed in claim 1,
characterized in that the container is constructed from three concentric pipes having lid and bottom and having a bursting charge (7) in the inner pipe, the liquid smoke in one of the compartments (9) and the acid neutralizing component in the second compartment (8).
3. Arrangement as claimed in claim 1,
characterized in that the grenade is constructed by an outer pipe (11) and a centre pipe (15) having bursting charge, there being around the centre pipe in the compartment between the outer pipe and the centre pipe provided a concentric glass container (12) having liquid smoke (13), the rest of the compartment (14) being filled up with the acid neutralizing material, through a bottom inlet (16).
4. Arrangement as claimed in claim 2,
characterized in that in the lid of the canister there is mounted an ignition mechanism for hand grenade (3) and which after ejection will fire, after a delay time, a bursting charge located in the centre pipe (7), whereby the canister is burst and the components scattered in the air.
5. Arrangement as claimed in claims 2 and 3,
characterized in that in the bottom of the container there is attached a metal canister comprising a pyrotechnical smoke charge (19).
6. Arrangement as claimed in claim 5,
characterized in that during the bursting of the container the flame tongue from the bursting charge will ignite a conveyer (17a) of the attachment plug, which ignites the adjacent blasting charge (21) in

the metal canister for thereby firing the exposed surface of the pyrotechnical smoke charge, whereafter smoke and combustion products will escape through downwardly extending channels in the smoke charge (20) and out through holes in the bottom of the canister (22).

7. Arrangement as claimed in claims 1, 2 and 3,
characterized in that the hand grenade ignition mechanism (3) has been replaced with a metal member, wherein are provided a blasting cap (23), a powder charge (26), discharge holes for powder gases (25) and a black powder delay unit (27) being connected with the bursting charge (28) which is present in the centre pipe.
8. Arrangement as claimed in claim 7,
characterized in that the hand grenade is located in an appropriate pipe having an ignition bolt and being discharged by the ignition bolt which upon firing impinges into the blasting cap (23) in the metal rear member, which thereby expels a flame tongue into a black powder conveyor (24) which ignites the powder charge (26), whereby the canister is discharged from the pipe due to the gun powder gases escaping through the holes in the metal rear member and the bursting charge being fired through the black powder delay unit (27).
9. Arrangement as claimed in claims 2 and 3,
characterized in that the liquid smoke is titanium tetrachloride and the acid neutralizing component is calcium powder ammoniac (30-35%), or an alifatic amine or some other acid neutralizing compound, and that the canister is manufactured from polyvinylidenfluoride or some other type of plastics.

Patentansprüche

1. Vorrichtung für eine Rauchhandgranate mit einem Behälter, der selbst ein flüssiges Rauchmaterial enthält, dadurch gekennzeichnet, daß der Behälter, der das flüssige Rauchmaterial (9a) enthält, von einer Zusammenstellung (8a) getrennt ist, die nach der Explosion die Säurenebenprodukte, die gebildet werden, nachdem die Flüssigkeit mit der Luftfeuchtigkeit während des Austretens von Rauch reagiert hat, neutralisiert.
2. Vorrichtung nach Anspruch 1, dadurch gekennzeichnet, daß der Behälter aus drei konzentrischen Rohren mit Deckel und Boden besteht und eine Sprengladung (7) in dem inneren Rohr aufweist, wobei der flüssige Rauch sich in einem der Fächer (9) und die Säureneutralisierungskomponenten sich in dem zweiten Fach (8) befindet.

3. Vorrichtung nach Anspruch 1, dadurch gekennzeichnet, daß die Granate mit einem Außenrohr (11) und einem Mittelrohr (15), das die Sprengladung besitzt, aufgebaut ist, wobei um das Mittelrohr in dem Raum zwischen Außenrohr und Mittelrohr ein konzentrischer Glasbehälter (12) mit flüssigem Rauch (13) angeordnet und der restliche Raum (14) mit Säure neutralisierendem Material durch einen Bodeneinlaß (16) aufgefüllt ist.

4. Vorrichtung nach Anspruch 2, dadurch gekennzeichnet, daß in dem Deckel des Kanisters ein Zündmechanismus für die Handgranate (3) montiert ist, der nach Herausziehen mit einer Verzögerungszeit eine Zündladung, die in dem mittleren Rohr (7) angeordnet ist, zündet, wobei der Kanister explodiert und die Komponenten in der Luft verteilt werden.

5. Vorrichtung nach Anspruch 2 und 3, dadurch gekennzeichnet, daß an dem Boden des Behälters ein Metallkanister befestigt ist, der eine pyrotechnische Rauchladung (19) aufweist.

6. Vorrichtung nach Anspruch 5, dadurch gekennzeichnet, daß während der Explosion des Behälters die Flamme von der Zündladung einen Träger (17a) des befestigten Stöpsels zündet, was die angrenzende Sprengladung (21) in dem Metallbehälter zündet, um dadurch die frei liegende Oberfläche der pyrotechnischen Rauchladung zu zünden, wonach Rauch und Verbrennungsprodukte nach außen abwärts durch die sich erstreckenden Kanäle der Rauchladung (20) und aus Löchern in dem Boden des Behälters (22) entweichen.

7. Vorrichtung nach Anspruch 1, 2 und 3, dadurch gekennzeichnet, daß der Handgranatenzündmechanismus (3) durch ein Metallelement ersetzt wurde, in dem eine Sprengkappe (23), eine Pulverladung (26), Ausstoßlöcher für Pulvergase (25) und eine Schwarzpulververzögerungseinheit (27), die mit der in dem Mittelrohr vorliegenden Sprengladung (28) verbunden ist.

8. Vorrichtung nach Anspruch 7, dadurch gekennzeichnet, daß die Handgranate in einem geeigneten Rohr mit einem Zündbolzen angeordnet ist und durch den Zündbolzen, der beim Abfeuern in die Zündkappe (23) auf das Metallhinterelement schlägt, wodurch dieses eine Flamme in einem Schwarzpulverträger (24) ausstößt, was die Pulverladung (26) zündet, wodurch der Behälter aus dem Rohr durch die aus den Löchern in dem Metallhinterelement austretenden Geschoßpulvergase getrieben wird und die Sprengladung durch die Schwarzpulververzögerungseinheit (27) abgefeuert wird.

9. Vorrichtung nach Anspruch 2 und 3, dadurch gekennzeichnet, daß der flüssige Rauch Titanetetrachlorid ist und daß die Säure neutralisierende Komponente Kalziumpulver, Ammoniak (30 bis 35 %) oder ein aliphatisches Amin oder einige andere Säure neutralisierenden Komponenten sind, und daß der Behälter aus Polyvinylflorid oder einer ähnlichen Art von Kunststoff hergestellt ist.

Revendications

1. Disposition de grenade fumigène à main comprenant un récipient qui, en lui-même, maintient une matière fumigène liquide, **caractérisée en** ce que le récipient qui maintient la matière fumigène liquide (9a), est séparé d'une composition (8a) qui, après explosion, neutralise les sous-produits acides en cours de formation après que le liquide a réagi avec l'humidité de l'air tout en émettant de la fumée.

2. Disposition telle que revendiquée à la revendication 1, **caractérisée en** ce que le récipient est réalisé à partir de trois tubes concentriques ayant un couvercle et un fond et présentant une charge explosive (7) dans le tube interne, la matière fumigène liquide dans un des compartiments (9) et le composé de neutralisation des acides dans le second compartiment (8).

3. Disposition telle que revendiquée à la revendication 1, **caractérisée en** ce que la grenade est réalisée par un tube externe (11) et un tube central (15) présentant une charge explosive en prévoyant, autour du tube central dans le compartiment entre le tube externe et le tube central, un récipient concentrique en verre (12) ayant une matière fumigène liquide (13), le reste du compartiment étant rempli de la matière de neutralisation des acides, à travers une entrée (16) du fond.

4. Disposition telle que revendiquée à la revendication 2, **caractérisée en** ce que, dans le couvercle de la boîte est monté un mécanisme d'allumage pour grenade à main (3) et qui, après éjection, enflammera, après un temps de retard, une charge explosive placée dans le tube central (7), de sorte que la boîte est amenée à exploser et les éléments constitutifs à s'éparpiller dans l'air.

5. Disposition telle que revendiquée aux revendications 2 et 3, **caractérisée en** ce que, dans le fond du récipient, est fixée une boîte métallique comprenant une

charge pyrotechnique fumigène (19).

6. Disposition telle que revendiquée à la revendication 5,

caractérisée en ce que, au cours de l'explosion du récipient, la langue de flamme provenant de la charge explosive allumera un organe de transport (17a) du bouchon de fixation, ce qui enflamme la charge explosive voisine (21) contenue dans la boîte métallique pour ainsi allumer la surface exposée de la charge pyrotechnique fumigène, après quoi la fumée et les produits de combustion s'échapperont à travers des canaux s'étendant vers le bas dans la charge fumigène (20) et sortiront par des trous prévus dans le fond de la boîte (22). 5 10 15

7. Disposition telle que revendiquée aux revendications 1, 2 et 3

caractérisée en ce que le mécanisme d'allumage (3) de la grenade à main a été remplacé par un élément métallique, dans lequel sont prévus un capuchon explosif (23), une charge de poudre (26), des trous de décharge pour les gaz de poudre (25) et une unité retard à poudre noire (27) étant reliée à la charge explosive (28) qui est présente dans le tube central. 20 25

8. Disposition telle que revendiquée à la revendication 7,

caractérisée en ce que la grenade à main est placée dans un tube approprié présentant un boulon d'allumage et étant déchargée par le boulon d'allumage qui, lors de la mise à feu, vient heurter le capuchon explosif (23) prévu dans l'élément métallique arrière, ce qui ainsi fait sortir une langue de flamme vers l'organe de transport de poudre noire (24) ce qui allume la charge de poudre (26), de sorte que la boîte est déchargée du tube du fait des gaz de poudre à canon s'échappant à travers les trous prévus dans l'élément métallique arrière et la charge explosive étant enflammée par l'intermédiaire de l'unité retard à poudre noire (27). 30 35 40

9. Disposition telle que revendiquée aux revendications 2 et 3,

caractérisée en ce que la matière fumigène liquide est du tétrachlorure de titane et le composé de neutralisation des acides est de la poudre de calcium, de l'ammoniac (30 à 35 %), ou une amine aliphatique ou quelque autre composé de neutralisation des acides, et en ce que la boîte est fabriquée à partir de fluorure de polyvinylidène ou de quelque autre type de matières plastiques. 45 50

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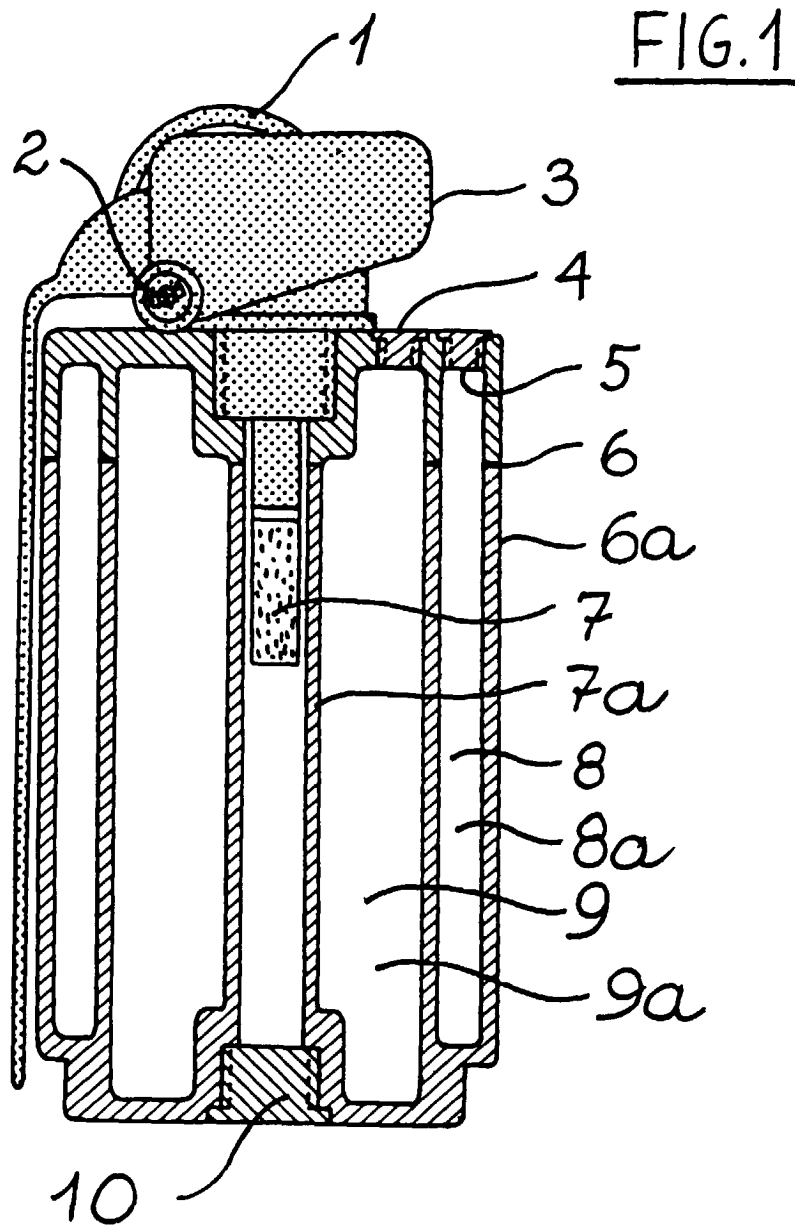


FIG. 2

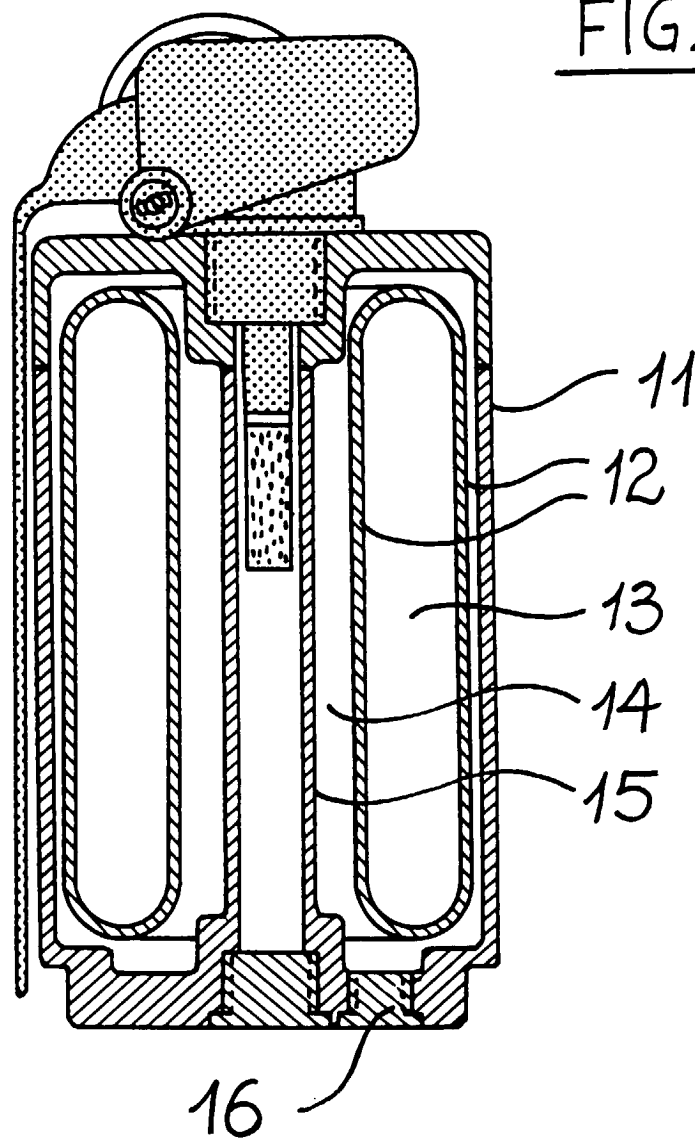


FIG.3

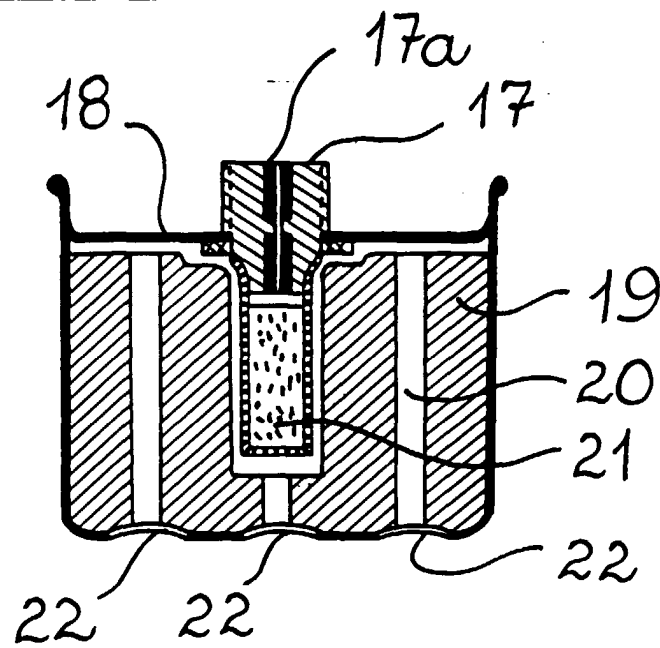


FIG.4

