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FLASH ELIMINATOR FOR GUNS

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Fig. 1.

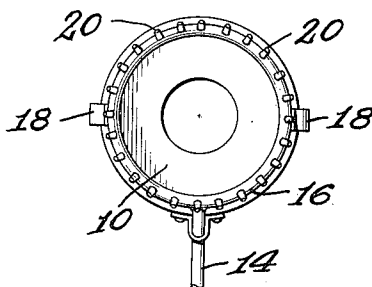
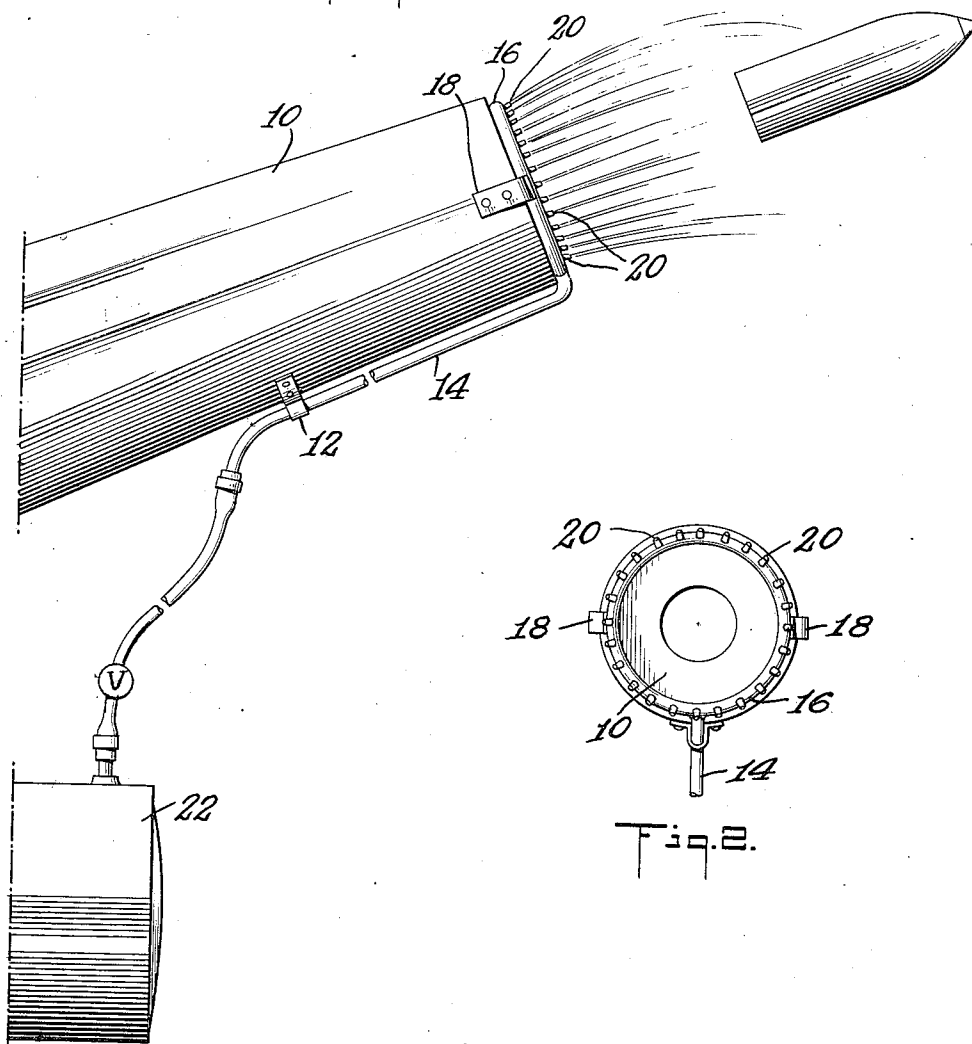


Fig. 2.

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## UNITED STATES PATENT OFFICE

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## FLASH ELIMINATOR FOR GUNS

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5 Claims. (Cl. 89—1)

According to current theories the muzzle flash of firearms is caused by a secondary combustion process. When burning gunpowder in a firearm a quantity of inflammable gases is formed, for the greater part carbon monoxide (CO) and hydrogen (H<sub>2</sub>). During the combustion in the barrel the carbon and hydrogen contained in the gunpowder cannot fully burn down to CO<sub>2</sub> and H<sub>2</sub>O, as the quantity of oxygen present in the gunpowder is not sufficient thereto. When these gases leave the muzzle and mix with the oxygen of the air the mixture will take fire, if a suitable proportion of mixture is attained and if the temperature of the gas mixture is still above the ignition temperature.

This flash is a highly undesirable phenomenon, as it discloses the position of the gun or the place of the gunner and blinds the gun-detachment.

Much trouble has been taken to overcome this disadvantage, but always the solution of this problem has been sought in the manufacture of a gunpowder showing but little or no flash, a so called "flashless" gunpowder. This solution, however, has the disadvantage that the flashlessness of gunpowder can only be obtained by sacrificing part of the ballistic property; e. g. with flashless gunpowder and under equal circumstances one must always be content with a smaller initial velocity of the projectile than would be attainable if the requirement of flashlessness was not to be answered. The same disadvantage is experienced if the flashlessness is obtained by adding foreign substances to the charge or by trying to cool the gases in the barrel behind the projectile by injecting a liquid in the barrel.

This invention seeks the solution of the problem in another direction and starts from the principle, that, using any kind of flash giving gunpowder, the powder is allowed to have its full effect on the projectile in the barrel, measures only being taken at the moment that the gases together with the projectile leave the muzzle of the firearm.

In order to prevent the gases from igniting at the said moment on account of their mixing with the oxygen of this air, according to the invention a layer of liquid is created between the outflowing hot gases and the surrounding atmosphere. This layer (or layers) prevents for a short time the gases from mixing with the air and accelerates the cooling down of the gases. Due to the strong expansion and subsequently to the mixing of the gases with the liquid, they are brought in such a condition that the gas mixture resulting from mixing with the air does no longer take fire.

In general a mere cooling action will suffice and the layer of liquid will then be water; however, in cases in which the desired effect can but difficultly be attained with water only, solutions of inorganic or organic compounds, organic liquids, emulsions or suspensions, etc. decreasing the inflammability of gas mixtures, may be used, as well as solutions of soap, saponine or other foaming means, which guarantee a better coating for the gas mass and consequently thus accelerate the cooling of the gases by expansion, before the mixture with air takes place.

In order to apply the liquid layer or layers in the right place a spraying device is mounted around or to the muzzle or further backwards on the stationary or recoiling parts of the gun, which device, according to the invention, is so constructed that just before discharging the gun it forms one or more somewhat diverging liquid layers in front of the muzzle, which temporarily envelop the outflowing gunpowder gases and separate them from the surrounding air. The liquid layer need not necessarily be uninterrupted. A spray with closely spaced apertures or an atomizing spray instead of a slit also has a good effect. In order to prevent the velocity of the projectile from being influenced by colliding of the projectile with the liquid, it is desirable that the latter is ejected with force, so that over some distance the spray remains almost parallel to its original direction, while thereafter the liquid atomizes more and more. It is also desirable to make the diameter of the spray circle larger than that of the barrel of the gun. The space between the sprayer and the barrel may generally remain open without any objection.

Referring to the drawing;—

Figure 1 is a side elevation view of a gun muzzle with one form of invention applied thereto.

Figure 2 is an end view of the gun muzzle shown in Figure 1.

In the drawing the gun muzzle 10 has secured to it in a suitable manner as by brackets 12, a liquid conduit 14 which terminates in a ring 16 surrounding the gun bore at the muzzle and held in place by a suitable means such as bracket 18. The ring 16 has projecting from it in direction of the projectile travel a series of nozzles or orifices 20. The nozzles or orifices are preferably divergent to compensate in a degree for the expansion of the gases issuing from the gun.

For controlling the flow of liquid, there may be inserted in the conduit 14 between the spray nozzles 20 and a reservoir 22, valve means of any

suitable construction. For the sake of illustration I have shown conventionally a valve "V".

In stationary mountings (ships, fortresses, etc.) the spraying device may be mounted independently of the gun and if desired may operate for several guns simultaneously, in which case one or more sprayers may be mounted for each gun, connected to a pipe through which the liquid is supplied under pressure. With mobile mountings it is desirable to make use of the recoiling of the fire-arm for bringing the liquid under pressure.

For the synchronization a regulating mechanism, connected with the discharging device, may be used.

15 The invention is applicable to all kinds of fire-arms.

I claim:

1. Apparatus for eliminating flashes from heavy or light ordnance, comprising means for 20 forming freely in air at the muzzle of a gun a liquid envelope for the outflowing gunpowder gases by the projection of liquid in the direction of a projectile travel, and means to cause the formation of said envelope just prior to the gun 25 discharge, whereby the hot gases are permitted to expand and cool within said envelope while being kept from freely mixing with the air.

2. Apparatus for eliminating flashes from heavy or light ordnance, comprising spraying 30 means positioned near the muzzle of the gun for creating freely in air an envelope for the outflowing gunpowder gases, and means to eject liquid from said spraying means in the direction of

projectile travel just prior to the gun discharge, whereby the hot gases are permitted to expand and cool within said envelope while being kept from freely mixing with the air.

3. Apparatus for eliminating flashes from 5 heavy or light ordnance, comprising a spraying device positioned at the muzzle of a gun for forming freely in air at least one diverging liquid envelope enclosing the gunpowder gases, and supply means for delivering liquid under pressure to 10 said device just prior to the gun discharge, whereby the hot gases are permitted to expand and cool within said envelope while being kept from freely mixing with the air.

4. The method of eliminating flashes from 15 heavy or light ordnance, comprising forming freely in air a liquid envelope at the muzzle of the gun, to enclose the gunpowder gases at the moment of gun discharge, whereby the hot gases are permitted to expand and cool within said en- 20 velope while being kept from freely mixing with the air.

5. The method of eliminating flashes from heavy or light ordnance, comprising projecting liquid freely in air at the muzzle of the gun in the 25 direction of projectile travel just prior to gun discharge to form an envelope enclosing the gunpowder gases at the moment of discharge, whereby the hot gases are permitted to expand and cool within said envelope while being kept from 30 freely mixing with air.

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