This invention relates to fire extinguishers of the kind in which a liquid extinguishing medium is expelled from its container by gas evolved from the burning of a powder grain, the invention being in the nature of an improvement upon the type of extinguisher which is the subject of Patent No. 2,530,653, dated November 21, 1950.

In the use of such extinguishers, it sometimes happens that, for greater effectiveness, the medium is required to be discharged, at the risk, through quite small apertures. This is the case, for example, in aircraft extinguishing systems employing CB liquid as the extinguishing medium. However, the smaller the discharge aperture the greater is the chance of their becoming obstructed by foreign matter in the medium.

In the case of pyrotechnic expelled media, the pyrotechnic unit itself is a possible source of such foreign matter, as in the form of spent powder particles, and it is the object of this invention to provide a construction which guards against the entry into the medium of solid particles originating in the pyrotechnic unit. The invention provides what in effect is what may be termed a filter unit, although it appears to function largely, if not entirely, by effecting the consumption or practically complete disintegration of foreign matter in the gas generated by the burning charge before such matter reaches the extinguishing medium.

The invention will be readily understood from the following description of the accompanying drawings in which:

Fig. 1 is a vertical section of an extinguisher incorporating a preferred form of the invention;

Fig. 2 is a vertical section, enlarged, of a suitable pyrotechnic unit; and

Fig. 3 is an enlarged, partially sectioned elevation of the filter portion of the extinguisher of Fig. 1.

In this preferred embodiment, the extinguisher comprises a spherical container for the liquid, having a bottom outlet shown as consisting of an elbow fitting, the vertical bore of which is normally closed by a diaphragm. As will be understood, this diaphragm is designed to be ruptured by the internal pressure upon ignition of the powder grain, the ruptured portion being blocked from passing beyond the neck portion of the fitting and into the discharge line by the screen 4.

The pyrotechnic charge is mounted in the upper part of the container. As shown in Fig. 2, it consists of a hermetically sealed container, proof against deterioration, comprising a powder grain and, above it and separated from it by a screen, an igniter charge of black powder. Two electric screws are inserted in the latter charge to ignite it. A contact 10 is sealed in the cover of the unit. The element 8 is a so-called grid, comprising a piece of wire which serves to locate the powder grain and space it slightly from the bottom of the container, to facilitate burning of the grain from both ends rather than from the top only and thereby increase the rate of gas generation. The pressure developed within the charge container is sufficient to rupture part of the bottom wall over an unsupported area, as before described.

Seated in an opening in the upper part of liquid container and secured in place, as by welding, is an internally threaded neck piece having an internal shoulder at its lower end providing a seat for the flanged upper end of an open-topped container cup which is the pyrotechnic unit is supported. As will be noted, the extinguisher is normally closed by the threaded plug or stopper which carries the usual binding post 15.

The pyrotechnic unit is supported in the container cup as in the said prior patent, that is to say, on a floor member which has a central opening bounded by a depending flange, the flange having relatively large openings opening into the annular space surrounding the flange. When the charge is set off, the unsupported central portion of the charge container bursts through, the ruptured or sheared out portion moving down into the space within flange.

As in the said patent, the container cup is provided with a series of restricted metering orifices for the controlled escape of the gases. In this instance, however, the metering orifices, marked, do not discharge the gases directly into the interior of the liquid container. According to the present invention, the gases are first passed through what will be termed a filter element, a device which causes the gases to traverse a baffled, circuitous path preferably defined by orifices in a succession of chamber walls.

In the illustrative embodiment shown in the drawings, the bottom of the container cup is provided with a depending boss 21 threaded to receive stud 22. Surrounding boss 21 is an annular filter element having inner and outer walls, and which element is clamped between the bottom of the container cup and a baffle member. In this preferred form the filter element comprises a single piece, of inverted U-section. As will be seen, the metering orifices open into the chamber or space enclosed by the inner wall of the filter unit.

Both walls of the filter unit are perforated, the inner wall by a single series of holes and the outer wall by two series of smaller, staggered holes, the series of holes in the respective walls being offset or out of alignment and the holes in the outer wall so arranged that the gas discharge from them is intercepted by the upwardly directed baffle flange or skirt. While the holes 27 are individually smaller than the two metering orifices, their combined area is substantially greater than that of such orifices. The combined area of the holes 28 likewise substantially exceeds that of the metering orifices but is less than that of the holes 27.

By such means the escaping gases generated by the powder grain are caused to change direction several times and, in traversing their circuitous escape path, impinge on substantial surface areas of the filter-baffle unit. In the result, as has been found, the spent powder particles are consumed or reduced to such size as to be of no consequence so far as clogging of the discharge outlets is concerned. The filter unit itself is found to remain remarkably clean, although as will be recognized, it is readily removable for inspection.

It will be understood that the details of this preferred form of the invention are subject to modification and that the embodiment disclosed is merely illustrative of the principles of the invention.

The following is claimed:

1. In a pyrotechnic-operated fire extinguisher, the combination of a medium container having an internally shouldered neck piece a pyrotechnic unit container cup depending from the neck shoulder into the container; a
baffle spaced from and secured to the bottom of the container cup; and a filter unit intermediate the baffle and the bottom of the said cup; the cup having gas metering outlet orifices communicating with the filter.

2. In a pyrotechnic-operated fire extinguisher, the combination of a medium container having a threaded neck piece; a removable pyrotechnic unit container cup suspended from the neck piece and depending therefrom into the medium container; a threaded closure plug for the neck piece abutting and clamping the said cup; gas outlets from the cup to the interior of the medium container; a gas baffle carried by the said cup for bodily removal therewith on removal of said plug; and means removably securing the baffle to the cup.

3. In a pyrotechnic-operated fire extinguisher, the combination of a medium container having a threaded neck piece incorporating a shoulder below its threaded section; a removable pyrotechnic unit container cup dimensioned to pass into the medium container through the neck piece and having a flange adjacent its upper end adapted to seat on said shoulder; a threaded closure plug for the neck piece adapted for clamping engagement with the upper end of the cup; gas outlets from the cup; a filter carried by the cup in the path of discharge from the cup gas outlets; and means removably securing the filter to the cup.

4. In a pyrotechnic-operated fire extinguisher, the combination of a medium container; a pyrotechnic container cup mounted on and depending within the container; a filter chamber adjacent a wall of the cup; the said wall of the cup having gas metering orifices opening into the filter chamber and the filter chamber having a plurality of restricted discharge outlets having an aggregate cross-sectional area exceeding that of the gas metering orifices.

5. In a pyrotechnic-operated fire extinguisher, the combination of a medium container; a pyrotechnic container cup mounted on and depending within the container; a filter chamber adjacent and below the bottom wall of the cup; the said bottom wall of the cup having downwardly directed gas metering orifices opening into the filter chamber and the filter chamber having a wall incorporating a plurality of laterally directed, restricted discharge outlets.

6. The combination with a medium container having a pyrotechnic container cup mounted therein and having gas escape orifices, of a filter mounted adjacent the cup in gas receiving relation to the said orifices and incorporating a circuitous gas escape passage to the interior of the medium container.

7. The combination with a medium container having a pyrotechnic container cup mounted therein and having gas escape orifices, of a filter mounted adjacent the cup in gas receiving relation to the said orifices and incorporating a plurality of walls having gas escape openings therein.

8. The combination with a medium container having a pyrotechnic container cup mounted therein and having gas escape orifices, of a filter mounted adjacent the cup in gas receiving relation to the said orifices and incorporating successive partition walls having offset openings therein to form a circuitous gas escape passage to the interior of the medium container.

9. The combination with a medium container having a pyrotechnic container cup mounted therein and having gas outlet metering orifices therein, of a filter mounted in gas receiving relation to said orifices and incorporating a plurality of walls each having a series of gas escape openings therein, the aggregate cross-sectional area of the openings of each series being greater than that of the said metering orifices.

10. The combination with a medium container having a pyrotechnic container cup mounted therein and having gas escape orifices, of a circular filter wall mounted adjacent the cup with the space enclosed by the wall in gas receiving relation to said orifices; the said wall having a plurality of outwardly directed escape openings; and an upwardly directed baffle member mounted in the line of discharge from said escape openings.

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