

(19) World Intellectual Property
Organization
International Bureau



(43) International Publication Date
19 February 2004 (19.02.2004)

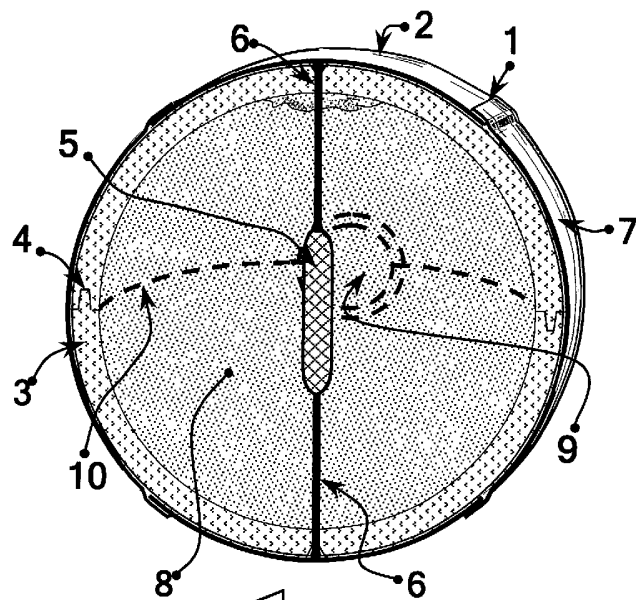
PCT

(10) International Publication Number
WO 2004/014489 A1

- (51) International Patent Classification⁷: A62C 8/00, 35/08, 19/00
- (21) International Application Number: PCT/US2002/025158
- (22) International Filing Date: 9 August 2002 (09.08.2002)
- (25) Filing Language: English
- (26) Publication Language: English
- (71) Applicant: JUTABHA, Sally [US/US]; 394 North Central Boulevard, P.O. Box 1499, Quartzsite, AZ 85346-1499 (US).
- (71) Applicant and
(72) Inventor: KAIMART, Woradech [TH/TH]; 14/8-9 M.1 Tambon Khaomaikaew, Banglamung, 20150 Chonburi (TH).
- (74) Agent: RAY, Michael, B.; Sterne, Kessler, Goldstein & Fox P.L.L.C., 1100 New York Avenue, N.W., Suite 600, Washington, DC 20005-3934 (US).
- (81) Designated States (*national*): AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NO, NZ, OM, PH, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TN, TR, TT, TZ, UA, UG, UZ, VN, YU, ZA, ZM, ZW.
- (84) Designated States (*regional*): ARIPO patent (GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE, SK, TR), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

[Continued on next page]

(54) Title: FIRE EXTINGUISHING BALL



(57) Abstract: A fire extinguishing device of the explosive type is disclosed for use against conflagrations, wherein the force of detonation of the device is minimized through the use of low density/low mass components; no part of the device having sufficient mass or density to constitute a ballistic hazard, nor be hazardous in concussive shock due to the explosive burst. The present invention is composed of a lightweight casing (3) of frangible material, with a protective exterior sheathing (7). Within the internal cavity of the device, a pyrotechnic detonator (5) is located at or near the center of mass, and is actuated by fuse cord(s) (6) extending from the detonator, the end(s) of which extend(s) from the interior detonator to mounting on the exterior surface. The device is chargeable with a variety of fire-retardant chemical agents (8), including dry powders, two-part reactants, liquid components or others, singly or in combination.

WO 2004/014489 A1

**Declaration under Rule 4.17:**

— as to applicant's entitlement to apply for and be granted a patent (Rule 4.17(ii)) for the following designations AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NO, NZ, OM, PH, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TN, TR, TT, TZ, UA, UG, UZ, VN, YU, ZA, ZM, ZW, ARIPO patent (GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent

(AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE, SK, TR), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG)

Published:

— with international search report

For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

FIRE-EXTINGUISHING BALL**TECHNICAL FIELD**

The invention relates to fire extinguishing devices. In particular, this invention relates to a device that disperses
5 fire-fighting chemical agents, both wet and dry types, through the use of an explosive force.

BACKGROUND ART

Fire-fighting devices in general use at present, are subject to numerous limiting factors with respect to their cost
of acquisition, placement, storage, deployment for fire-fighting - or fire suppression - and other factors. By their nature,
they may require periodic inspection by qualified, knowledgeable persons, training or esoterically detailed familiarity in
10 their use, are typically bulky and/or require, as centralized sensing and extinguishing systems, extensive, expensive
installation to afford the protection they are designed to provide.

Small fire safety devices, such as the common pressurized dry chemical extinguisher, are relatively heavy, due to
the prerequisite construction of their pressurized containers. Their weight, bulk and relative complexity, adds to the cost
of manufacture, and therefore, theoretically, their cost of acquisition. In use, their directed stream of chemical spray
15 requires judgment and forethought, and therefore, a fully conscious and cognizant user whose mental faculties have not
been impaired by smoke, heat, mental stress or panic.

Sprinkler systems, are subject to high installation costs, and may fail to effectively fight fires due to limited water
supplies, pump failures, sedimentary clogging of water supply piping, or failure to install sprinkler heads with sufficient
coverage areas throughout an edifice, among other factors.

20 A drawback to nearly any fixed installation of fire-fighting equipment, such as fire hoses and sprinklers, is that
they are often installed with less than complete coverage area for the full extent of the interior space they were installed
to protect, due to simplified installations, the limits of their dispersal patterns from fixed mountings, or physical
obstructions to retardant discharge. An example being a single dispersal unit, such as a water sprinkler head, in the
center of a hotel room, which if actuated due to fire, would have a dispersal pattern which might not reach all corners of
25 an irregularly shaped room, such irregularities commonly including short entrance corridors and closets blinded from the
sprinkler head by corners, etc.

Thus, the present invention is designed as a product which is versatile in installation mounting, i.e., mountable in
a simple holder on walls, desk, counter or table surfaces, or elsewhere, and be able to self-actuate when situated as
thus, yet can be lifted out of its holder and deployed manually, should any occupant of the room or area deem
30 appropriate, and be conscious and capable of doing so.

Explosive devices for fire-fighting purposes, in prior art, have often demonstrated high efficiency in extinguishing localized blazes, but have shown limitations, again, in cost and the relative sophistication of their design impacting complexity in manufacturing process. Also their methods of storage, deployment and/or use, such designs may be seen to require expert use, inhibiting broad public acceptance. Again, as mentioned previously, dispersal patterns of the fire
35 extinguishing chemicals from some explosive fire-fighting devices may, in some cases, be less than uniform or ideal. Two other important detractors to explosively dispersed chemical fire-fighting devices are the force of detonation experienced with some, and subsequent flying debris from even some minute parts of such devices, despite frangible casings, therefore being therein safety hazards unto themselves.

In nearly all prior art, be they of explosive type or other means of delivery, the cost of manufacture and/or
40 installation, and therefore the cost of purchase is a limiting factor to broad public demand; this factor being most acutely apparent in underdeveloped countries, and even in poorer communities of developed nations.

The bulk and subjective unsightliness of even the common dry chemical, pressurized tank-type fire extinguisher aesthetically limits their installation in many private dwellings worldwide. One does not typically find such devices mounted in living rooms, or guest reception areas, sometimes purely for aesthetic reasons.

45 Frequently, only one fire-extinguisher is maintained for the entirety of a private dwelling, and it may fail to work after lying dormant many years, due to its need of periodic inspection and maintenance by qualified personnel; something often overlooked by owners of private dwellings. And with only one fire-fighting device deployed at some point within the dwelling, the possibility exists that a path to it may be blocked by flame and/or smoke, especially when a fire starts and spreads while the occupants are asleep.

50 The present invention is intended to overcome or ameliorate the above limitations in prior art.

DISCLOSURE OF THE INVENTION

1. Object of the Invention

The object of this invention is to provide an inexpensive, compact and easily used device, which, while being
55 of the explosive type, does not present any serious safety hazard in its actuation.

It is important to establish in this portion of the disclosure that the present invention is a single-use device, which is environmentally friendly in its basic construction, and leaves little more residue than the expended fire extinguishing/suppressant chemicals employed with the device, when actuated. No attempt is made to affect reusability in the device, because a reusable device requires components that can withstand the stresses of
60 remanufacturing processes, add the need for a recycling infrastructure that can not only 'refill' the device, but also test

and certify that the recycled device can perform again at the required level of protection or usefulness. This of course leads to the requirement that the reusable components must be sturdy enough not only for refilling/remanufacturing, but to be able to reliably perform for more than one use. These preconditions to a reusable device, especially with respect to a device upon which lives and property would depend, are felt to economically prejudice reusable containers or systems for general public use.

What is logically required in a low-cost, easily manufactured, effective fire-fighting device is, a low mass, inexpensively manufactured containment vessel, with a maximum of fire-retardant chemical agent within such a device – viewed as a relatively high percentage of weight/mass of the fire-fighting agent to the total weight and mass of the complete functional unit - and a method of dispersal of the chemical agent by a rapid means, which in itself is lightweight, does not create bulk, is inexpensive and places few demands on the device container while the device is stored and unused. General public acceptance also requires other values, as well, those being that it is highly effective in its work, that it is intuitively easy to use, compact enough to be placed anywhere near at hand when needed, and that it be inexpensive.

Thus, the device disclosed herein is intended to have the following features-

A simple, self-contained design, and of a construction whose physical integrity and ability to operate can be quickly surmised through visual inspection of its exterior by ordinary persons not highly versed in technical knowledge, and be -

inexpensive and easily manufactured in nearly any country, worldwide;

so intuitively simple in its use that even a confused or partially impaired user may employ it with little forethought;

so innocuous in size and shape that it may be installed or stored in nearly any environment without esthetic objection;

capable of actuation with or without human intervention, and if without, that upon detonation provides sufficient aural report to warn persons in the vicinity of the fire threat.

2. General Description

The present invention is an explosive, fire-fighting device comprised of three basic components, being –

- a) A frangible casing whose composition represents no threat as shrapnel,
- b) Fire-fighting agents such as are commercially available, whether being either dry, wet, or of other form in single or multiple component combinations,
- c) A detonating device with low explosive yield, insufficient to deliver a debilitating concussive shock to humans at

even relatively close proximity to the device during actuation, preferably of a type lacking any constituent part with sufficient hardness, mass or density to constitute shrapnel-like, ballistic hazard, and be commercially available and commonly found.

In the preferred embodiment, component a) is comprised of a low-density, rigid plastic foam shell molded to shape, which may be, but is not limited to, a sphere – comprising one hemispherical molded shape, where two of the same molded part form a complete sphere, which again, is not intended to limit the present invention to only one shape, nor exclude other possible configurations of the casing.

If the seam formed by the assembly of two such hemispheres together may be considered a latitudinal plane of reference, then at the polar regions of the component hemispheres, or other convenient point(s), small holes are located with adjacent exterior surface cavities through which small pyrotechnic fuse cords are protruded and laid flat, i.e., flush in the aforementioned cavities. A round filler hole molded into the hemispheres at the joint between them suffices as an orifice for charging the device with the chemical fire-fighting agent(s) after assembly of the casing halves into a whole unit with the detonator already inside.

The wall thickness of a rigid foam casing has been found to be adequate at between 0.8 – 1.0 centimeter, for a device approximately fifteen centimeters in diameter. An adhesive compatible with the casing material may be employed in assembling the two casing halves, but is not essential.

Surrounding the assembled casing, as outer layers, are typically one or more layers of commonly available, moderate thickness, plastic shrink-wrap film. In the spherical exterior embodiment of this device, the first layer would be a wide band of the shrink-wrap film applied in a vertical orientation, crossing the poles of the sphere, holding secure the two hemispheres, as well as the filler plug, and also covering the fuse ends at or near the poles. This layer, after low temperature hot air is applied to the shrink-wrap film, covers most of the sphere. A second band, being the same part – in size, thickness and diameter - as the first layer, is applied latitudinally about the seam formed by the two assembled halves. When the second band is heat-contoured to the sphere, the layers together completely cover the exterior of the invention. The shrink-wrap film layer(s), no matter what the external shape of the device is, can provide the structural quality which typical low-density, rigid plastic foam materials for the casing lack, i.e., a tensile external 'skin' more resistant to surface abrasion. This sheathing also helps to make the invention highly water-resistant, where desired, with the additional modest application of silicone-based, or other, sealants in a few selected areas.

Component b) is the primary, and possibly secondary, fire-extinguishing agent. The choice of chemical agent is limited only to that the core chemical -- meaning the chemical charge in a single walled version, or the inner core charge of the multi-walled version of the present invention -- should be of the dry powder type, such as of commercially available

ammonium phosphates or sodium carbonate types, or any other suitable fire-fighting chemical in dry powder form; otherwise the detonator must be impervious to the agent in any other physical form, or the detonator must be isolated from the chemical agent through protective wrapping or coating.

The choice of chemical agent is determinable by availability, cost and intent to specialize a version of the present invention for a particular type of fire hazard.

Liquid or even gaseous agents at atmospheric pressure may otherwise be accommodated by adding them to the outer cavity, or cavities, of a multi-walled construction, with outer casing(s) essentially much the same construction as the inner casing, only larger. It has been found that even plain water affords a marked increase in fire-fighting efficacy as an instantaneous coolant, through misting, upon detonation of the device, though other commercially known, specialized liquid agents may provide higher, specialized efficiency.

Component c) is the detonator with fuse cords at either end. These common, commercially available pyrotechnic detonators are typically of the magnesium/aluminum powder-based type, and are chosen for wide availability, in sizes with only just enough explosive yield to burst the casing(s) of the device, and disperse the fire-extinguishing agents in an effective pattern.

A small, fifteen-centimeter diameter, single component, dry chemical device of this invention has been found to be capable of dispersing its chemical agent up to two meters, or more, from the point of detonation, in an omnidirectional dispersal pattern - given the preferred spherical exterior configuration, and can effectively achieve effectively spontaneous dousing of flames within that radius for many types of fires, without the need of much explosive force. It has also been found that the force required to disperse dry powder chemical cores in a fifteen-centimeter diameter device of this invention will in most cases cause only slight temporary bruising to bystanders at a stand-off range of 0.5 meters or less, and be very unlikely to cause any permanent injury even if in direct contact with the device during detonation, depending on variations in actual construction and moderation in choice of detonator yield.

This is due to the fact that the container, or casing, of the invention is made from the lightweight frangible material with sheathing as previously disclosed. While this configuration is sturdy enough to sustain the physical integrity of the device against moderate external physical abuse, and permitting a long shelf life, the force required to shatter it from within and disperse its chemical agent(s) is not great.

BRIEF DESCRIPTION OF DRAWINGS

1. List of Drawings

Included in this disclosure are five drawings of the present invention, including certain modifications to the

basic design. These drawings do depict all essential elements of the device, however, they are not intended to limit the external shape to only those shown.

FIG. 1 depicts a cutaway sectional view of the fire-extinguishing device in perspective.

FIG. 2 is a view of the basic external shape version of this invention, and locates the plane of reference for the sectional view used in several other drawings.

FIG. 3 is a sectional view of a double-walled modification to the basic design of the fire-extinguishing device.

FIG. 4 is an exploded, perspective view locating details at the rear and base of the present invention.

FIG. 5 depicts an alternative external configuration to the basic design of the fire-extinguishing device, being an alteration purely for visual esthetic appeal.

160

2. List of Reference Numerals Employed in the Drawings

1. - Region of overlap between shrink-wrap plastic film layers
2. - Vertically (or 'longitudinally') bound shrink-wrap plastic film layer
3. - Frangible casing
- 165 4. - Tongue-and-groove joint cast into the rim of the hemispheres
5. - Detonator
6. - Fuse cord (at either end of detonator)
7. - Horizontally (or 'latitudinally') bound shrink-wrap plastic film layer
8. - Fire-extinguishing chemical agent filler
- 170 9. - Filler hole and fitted plug
10. - Seam between hemispherical casing halves
11. - Secondary fire-extinguishing chemical filler within outer cavity of double-walled modification of the basic design
12. - Spacer ring between inner and outer casings
13. - Molded-in polar locating nodes, double-walled modification
- 175 14. - Outer casing, double-walled modification

MODES FOR CARRYING OUT THE INVENTION

To meet the prescribed specification in the Summary, the containment vessel, seen FIG.1 and other drawings as 3, of the present invention utilizes lightweight, low density, rigid plastic foam as the preferred material, and

180 specify among the current best choices, EPS (expanded polystyrene foam). Environmentally friendly, this material is molded into the required component shape, of which the preferred embodiment would require a hemisphere, because the sphere assembled from it is basic and efficient in terms of manufacture, the ratio of interior volume relative to surface area is highest, and thus the size of the device is minimized, as well as being that shape which results in the most evenly omni-directional dispersal pattern when utilized.

185 In a spherical exterior embodiment, half of the rim of each hemisphere could feature a tongue protrusion and matching groove 4 on the other half of the rim – or other joint features, excepting a small portion of the rim reserved for (half of) the filler hole and fitted plug 9, permitting a single molding to be used for both sides of the sphere with a secure joint between them 10.

The present invention is intended to be projected by hand - meaning tossed, rolled, dropped or otherwise
190 delivered directly into the vicinity of a fire, upon which fuse cords 6 at either or both polar ends of the sphere would be ignited, subsequently activating the pyrotechnic detonator 5, whose explosive yield would shatter the foam casing and disperse the chemical agent(s) 8. This preferred embodiment is amongst the most economical solutions possible for the actuation of the device. This disclosure does not contend that the common paper or cardboard-wrapped fireworks pyrotechnic detonator is the only type which may be used, however, it is intended that, for general public use, the
195 detonator chosen must be of a type constructed of materials with such low density and mass of constituent parts that they effectively disintegrate into minute, non-hazardous flying debris upon explosion of the detonator.

Assembly of the present invention from its component parts begins with threading one of the fuse cords 6 of the detonator 5 through the hole made for it in the plastic foam casing 3, and then cutting that cord off at such a length and inserting its end into a casing depression cavity for the fuse 6 tip such that the detonator 5 will be suspended in the
200 approximate center of mass of the assembled device. The other fuse cord at the other end of the detonator is then likewise threaded through a hole in the base of the casing, and the two casing halves are pressed together and held in place by a tongue-and-groove joint 4, or other joint feature, whereafter the second fuse cord is likewise cut to length and embedded into a pre-molded depression cavity on the casing's surface.

A dry chemical fire-extinguishing/fire-suppressant agent 8 is then poured through the filler hole 9 into the
205 casing until it is full, and the hole is then closed with a fitted plug. A pre-sized plastic shrink-wrap band 2 or 7 - typically of PVC plastic, due to its lower heat requirement for shrinkage than polyolefin film - is then fitted to the casing 3 or 14. In the spherical embodiment, one shrink-wrap film band 2 would be fitted vertically (*meaning* that the centerline of the band would be oriented longitudinally), wherein the centerline of the circular shrink-wrap band should cross and cover the fuse cord 6 tips lying in cavities at the top and base of the assembly, as well as crossing the centerline of the filler

210 plug 9 at the seam between the hemispheres 10, in this preferred configuration.

That single shrink-wrap band 2 would effectively constrain the entire assembly of a sphere into a bound and sealed unit, but would not ordinarily cover the sphere's entire surface, due to the maximum shrink ratio of typical plastic shrink-wrap film being usually insufficient for the edges of the shrink-wrap band to effectively reduce their contour under application of hot air to completely, and neatly, enclose the entire spherical surface. Thus, lacking a film with higher
215 shrink ratio characteristics, the width of the shrink-wrap band is limited to that width which can be neatly contoured onto a spherical shape.

A second band 7 is then necessitated to the spherical assembly, this one latitudinally applied, i.e., fitted with the centerline of this band being co-located in a plane with the seam between the two hemispheres 10, and likewise heat-contoured to the sphere's surface with a hot-air blower or through a hot-air tunnel - as is industrially common -
220 with an operating air temperature considerably below the ignition temperature of the fuse cords of the assembly. At this point, the basic assembly of the device is complete.

Minor refinements to this procedure can include the addition of modest amounts of a silicone-based or other sealer compatible with the composition of the casing and the shrink-wrap film, to make the casing seams, filler plug and fuse cord holes impervious to intrusion of moisture, over and above the protection afforded by the shrink-wrap film.
225 This assembly process is simple and rapid enough that, given pre-molded casings, a workforce of ten unskilled workers, or less, is able to assemble hundreds of units per day by hand, making production of the present invention accessible to even quite remote and underdeveloped areas.

A modification, seen in FIG. 4 of the drawings supplied in this disclosure, is to encase the entire assembly described above within yet another, generally concentric shell 14, much like the first casing, but large enough to
230 enclose a cavity between inner and outer casings, wherein that cavity can be filled with a second fire-extinguishing agent 11, likely dry or liquid, the nature of which could be as a reactant with the dry chemical charge of the inner core, or a second chemical agent to broaden the range of the device against various specialized types of fires, or even the addition of a liquid coolant - even plain water - to increase the fire suppressing efficiency of the device. The use of such coolants is effective due to the sudden expansion of the liquid into fine vapor, thus creating a cooling effect, which
235 is known from many examples of prior art to have a marked effect on many types of fires.

Such 'multi-walled' construction as seen in FIG. 3 is not limited to a second outer casing in the intent of this disclosure. This disclosure contends that in this utility, the number of additional layers, and therefore chambers, that can be enclosed by yet another casing for separation of fire-extinguishing components is only limited to the practical value of the additional complexity of the additional layers. The advancement in the state-of-the-art here is the option of

240 such fire-fighting sophistication and versatility available in a small and simple device that can be assembled at rudimentary production facilities.

FIG.5 represents one example of a purely aesthetic alteration in the external profile of the present invention. Such alterations in the shape of the device are not intended to differ from the preferred embodiment's elemental characteristics of a shrink-wrap, plastic film sheathed, rigid foam hollow casing, enclosing fire-extinguishing agent(s) and a paper or cardboard wrapped pyrotechnic detonator; and therefore, a broad range of external shapes and sizes may be chosen for the utility, as dictated by aesthetics, required interior volume, need for a unique dispersal pattern, or other exigencies.

It should also here be stated that, because of the compactness and low cost of manufacture of the present invention, it is economically viable that such devices could conveniently be located at numerous points within buildings, including in the corridors, lavatories and even closets of schools, offices, homes and other edifices, providing therein a reliable and redundant protection against fires.

With fixed installations of the device resting in simple bracket holders, the desirable redundancy of self-actuated operation enhances the device's ability to provide protection by virtue of the pyrotechnic fuse and detonator, which permit the device to function spontaneously when placed statically in a bracket or holder, with its external surfaces largely exposed, without need of user intervention. Additionally, there is another inherent safety factor in the moderately loud audible burst upon detonation, which, if the device is self-actuated, suffices as a warning alarm, independent of other sensing devices or centralized systems using electronic circuitry.

The intuitively simple method of manual use requires less dexterity or forethought under tense, stressful conditions, increasing the likelihood of proper and effective use by unpracticed users. In cases where the blaze has advanced to the point of fuel sources and/or other fixtures having absorbed sufficient heat to smolder and re-ignite fires after initial flame suppression by any type of fire-extinguishing equipment, a small quantity of these devices are portable enough that they may be employed to help clear a path of exit out of an engulfed structure. As a 'disposable', single use device, when manual deployment is elected, projecting the device into a blaze is procedurally quicker, more basic and natural than the releasing of safety locks, engaging of actuators, opening of valves or switches, operating triggers and/or directing of sprayed suppressants into the variable areas to fight blazes, as in most prior art of one form or another. While those systems are not overly complex, it is widely known that victims of fires, even partially incapacitated by heat and/or smoke, and aware that they are in a life-threatening situation, may have difficulty with even simple tasks, wherein their mental faculties may thus be impaired.

CLAIMS

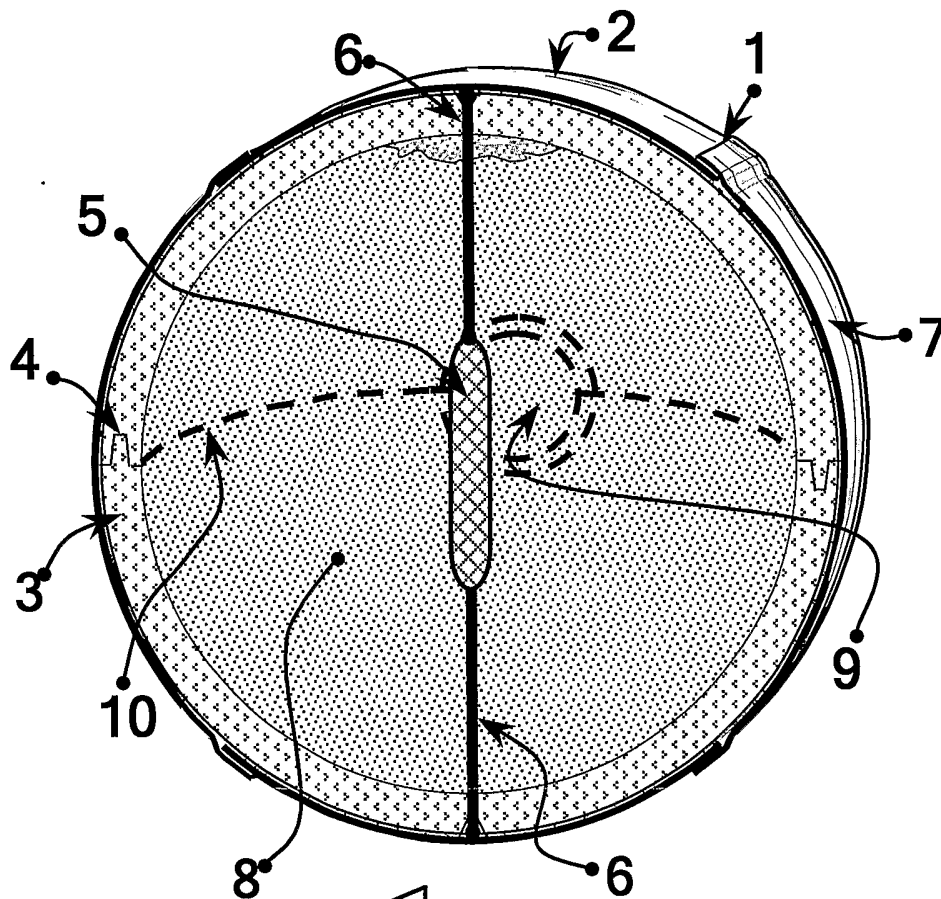
What is claimed is:

- 1.) A fire-extinguishing device of an explosive-type whose method of construction in the preferred embodiment comprises -
- 5 a) a low total mass, low density, frangible, hollow container composed of a rigid plastic foam or paper, wherein the casing in the preferred embodiment be – but is not limited to – expanded polystyrene foam covered externally by a PVC or PE plastic shrink-wrap or other thin protective film, itself frangible by nature, which thus acts as a mechanical binder to the assembled casing and its contents;
- 10 b) having as a filler to the hollow void of casing a) ammonium phosphate or sodium carbonate dry powder type fire retardant, or other fire-extinguishing retardant or suppressing mineral, chemical compound or mixture, having the physical form or characteristic of any dry powder typical to commercially available, compressed-gas propellant, tank-type fire extinguishers;
- 15 c) and contained within the core of the device, a method of actuation being, in the preferred embodiment, a pyrotechnic detonator of magnesium sulfate/aluminum powder type -- ignitable with fuse end(s) protruding out onto or near the exterior surface of the device casing a) -- having sufficient explosive yield upon ignition to shatter the assembled device and disperse the fire retardant substance b) over a wide
- 20 area.
- 2.) The device according to claim 1., with enhancement to the extent of:
- a) multi-walled construction, being at its core an embodiment as disclosed in claim 1, but having the casing of said device further enclosed by successively larger shell casing(s) as in claim 1.a), such that a void separates one casing from the next
- 25 outermost casing, having the purpose of creating additional separate space(s) in the device thus created;
- b) differing fire-retardant chemical fillers contained within the additional void(s) therein, be they of any physical form, wherein if more than one filler is employed within the

30 present invention of such that is incompatible with another component filler for mixing
or co-existing in the same internal space while the assembled device is in a stored
state, each filler requiring separation from another may be segregated into its own
layered casing, each successive casing layer encompassing the previous one, with at
least the outermost casing being constrained and protected on its exterior surfaces by
a thin plastic film sheathing, and the method of actuation being the same as the
35 embodiment thus disclosed in claim 1.

3. A device as in claims 1 or 2, wherein for specialized purpose and use, the pyrotechnic
detonator is augmented, altered or alternatively actuated by fire, heat or smoke sensing
and/or actuating element(s).

1/5



SECTION A-A

FIG. 1

2/5

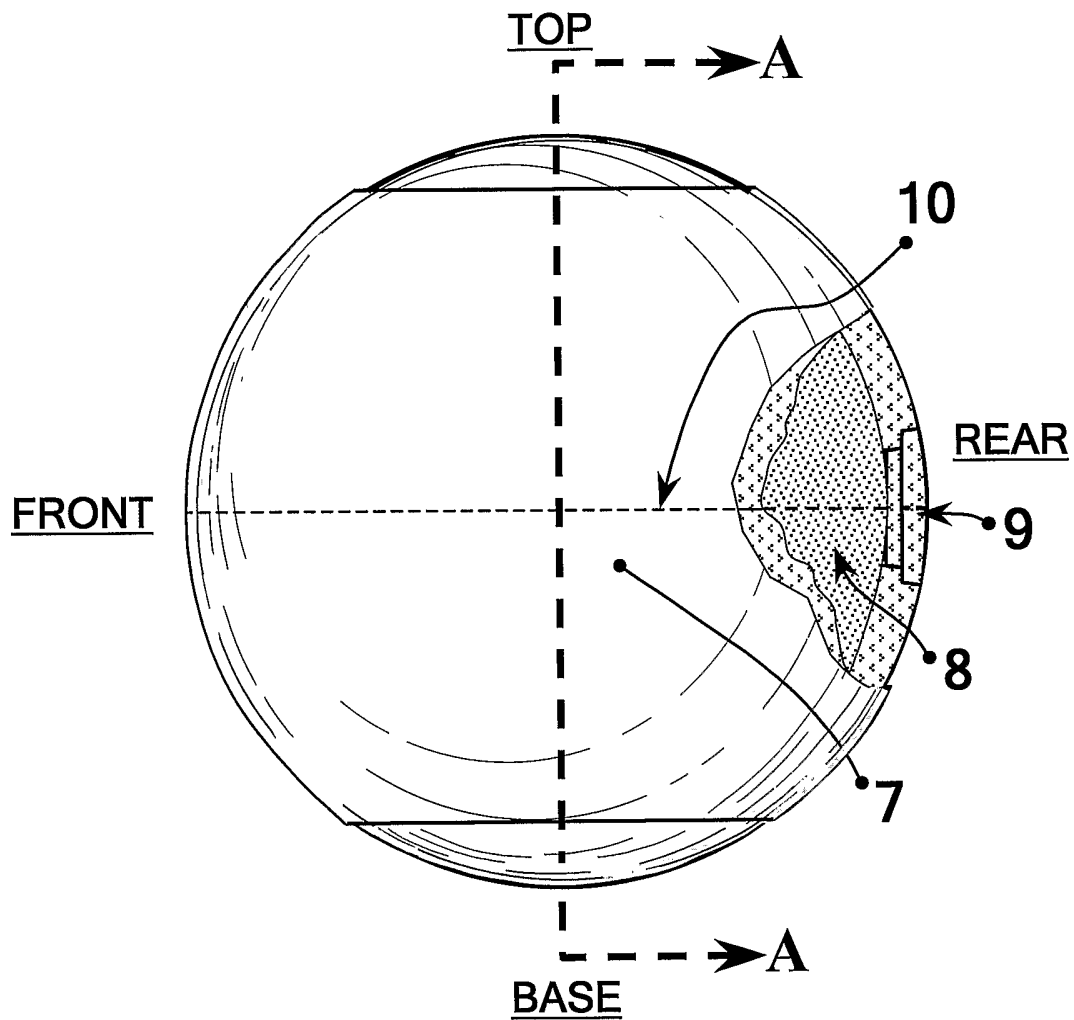


FIG. 2

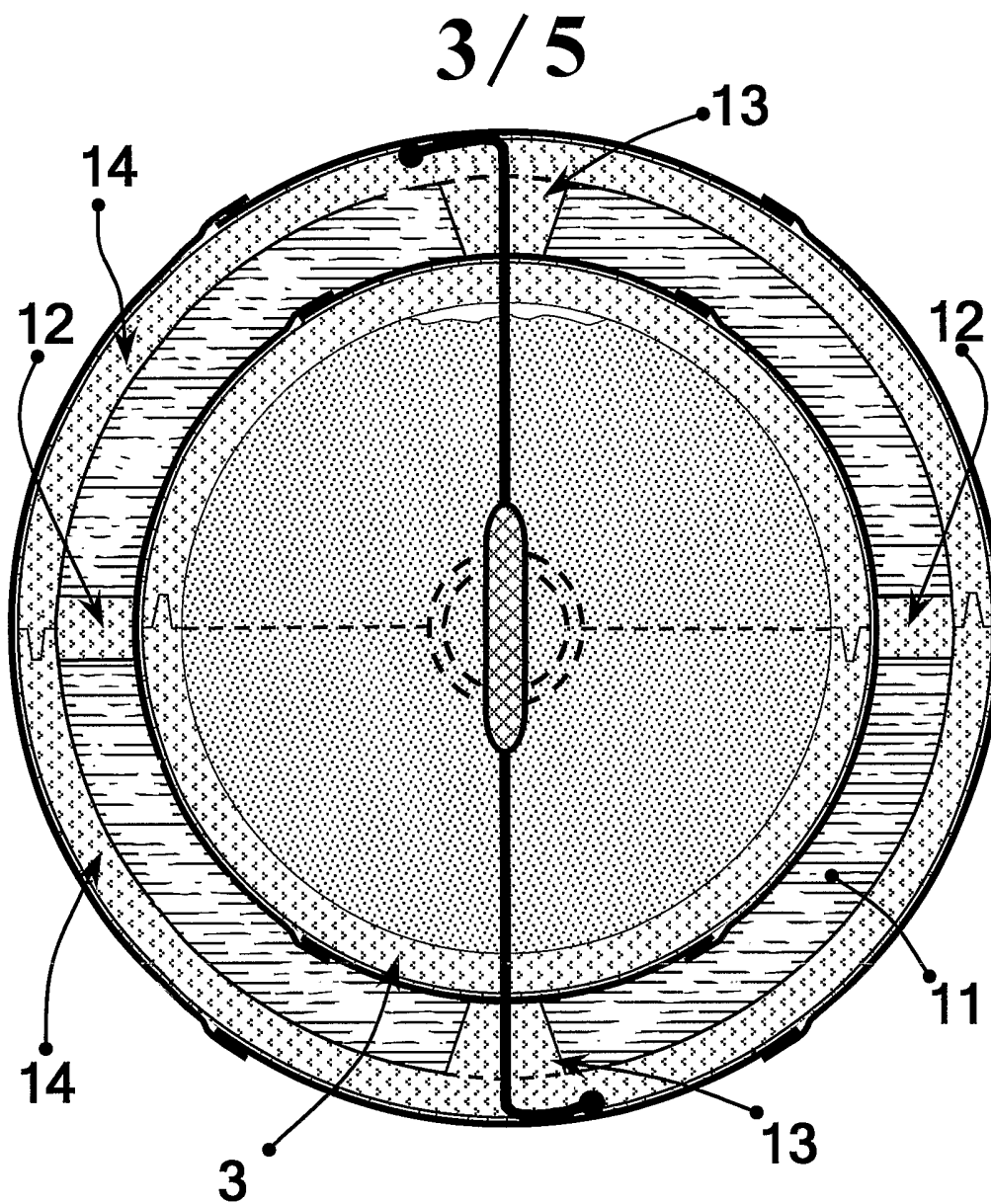


FIG. 3

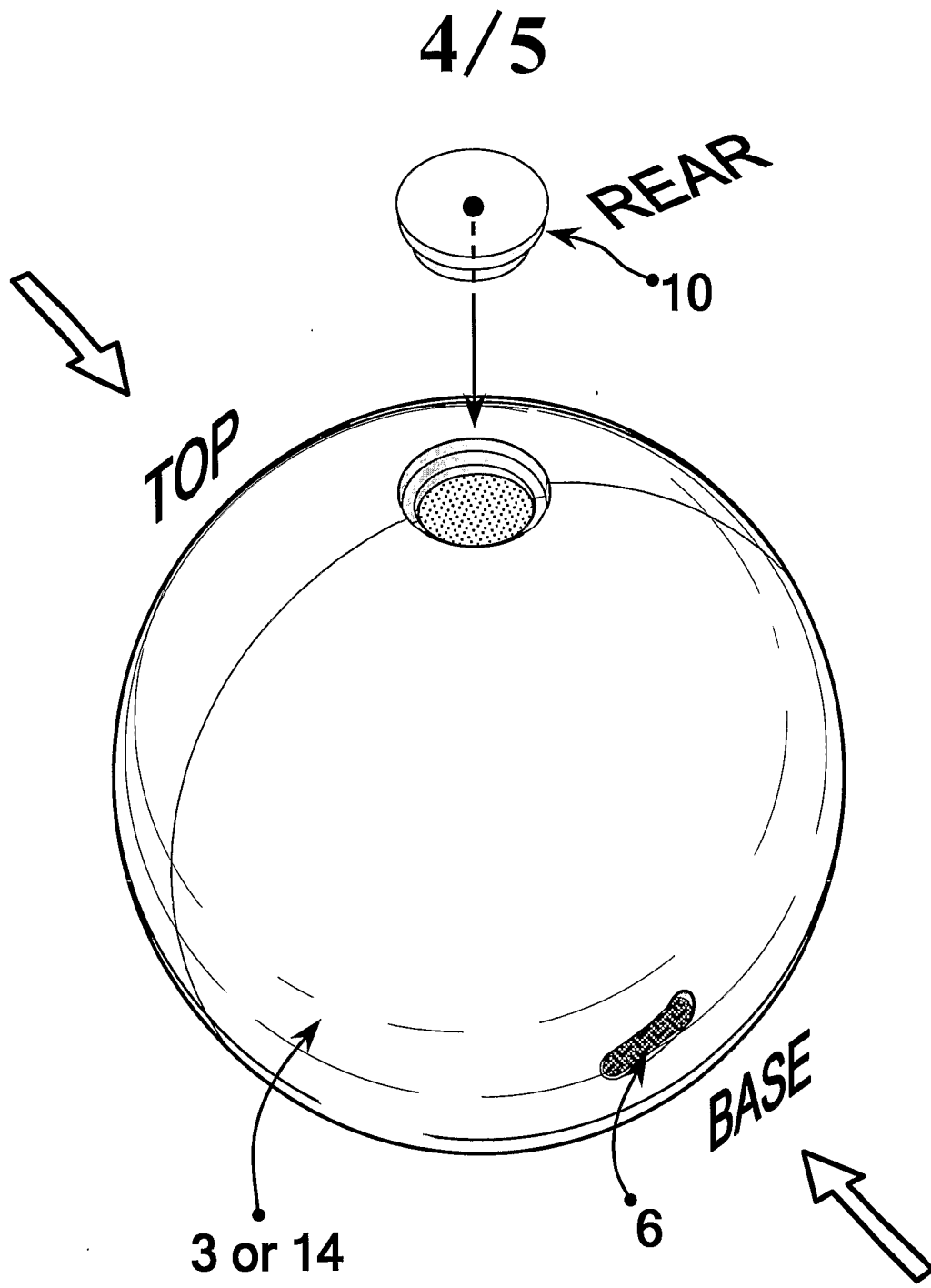
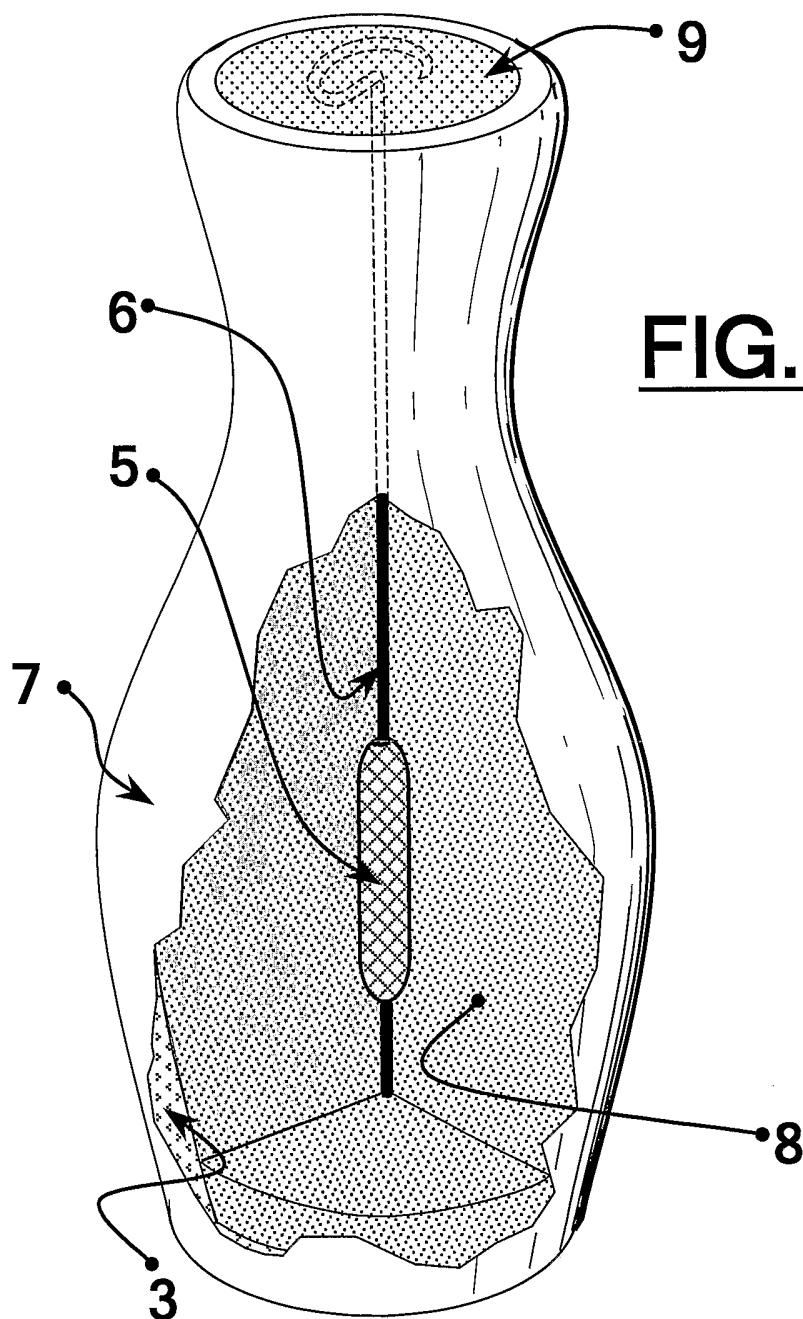


FIG. 4

5 / 5



INTERNATIONAL SEARCH REPORT

International application No.

PCT/US02/25158

| | | |
|---|---|--|
| A. CLASSIFICATION OF SUBJECT MATTER | | |
| IPC(7) : A62C 8/00, 35/08, 19/00 | | |
| US CL : 169/26, 28, 35, 36, 47, 54, 58, 70 | | |
| According to International Patent Classification (IPC) or to both national classification and IPC | | |
| B. FIELDS SEARCHED | | |
| Minimum documentation searched (classification system followed by classification symbols) U.S. : 169/26, 28, 35, 36, 47, 54, 58, 70 | | |
| Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched | | |
| Electronic data base consulted during the international search (name of data base and, where practicable, search terms used) Please See Continuation Sheet | | |
| C. DOCUMENTS CONSIDERED TO BE RELEVANT | | |
| Category * | Citation of document, with indication, where appropriate, of the relevant passages | Relevant to claim No. |
| Y | US 6,012,531 A (RYAN) 11 January 2000 (11.01.2000), see entire document. | 1-3 |
| Y | US 5,894,891 A (ROSENSTOCK et al.) 20 April 1999 (20.04.1999), see entire document. | 1-3 |
| Y | US 5,894,892 A (HUANG) 20 April 1999 (20.04.1999), see entire document. | 1-3 |
| <input type="checkbox"/> Further documents are listed in the continuation of Box C. <input type="checkbox"/> See patent family annex. | | |
| * Special categories of cited documents: | | |
| "A" | document defining the general state of the art which is not considered to be of particular relevance | "T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention |
| "E" | earlier application or patent published on or after the international filing date | "X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone |
| "L" | document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified) | "Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art |
| "O" | document referring to an oral disclosure, use, exhibition or other means | "&" document member of the same patent family |
| "P" | document published prior to the international filing date but later than the priority date claimed | |
| Date of the actual completion of the international search | Date of mailing of the international search report | |
| 12 November 2002 (12.11.2002) | 19 DEC 2002 | |
| Name and mailing address of the ISA/US | Authorized officer | |
| Commissioner of Patents and Trademarks Box PCT Washington, D.C. 20231 | Davis Hwu <i>A. Hurley for</i> | |
| Facsimile No. (703)305-3230 | Telephone No. (703)308-0861 | |

INTERNATIONAL SEARCH REPORT

PCT/US02/25158

Continuation of B. FIELDS SEARCHED Item 3:

EAST

search terms: fire, extinguishing, extinguish, bomb, explosive, detonator