

- [54] **COMMERCIAL COOKING UNIT FIRE EXTINGUISHER**
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- [22] Filed: **Nov. 19, 1973**
- [21] Appl. No.: **417,083**
- Related U.S. Application Data**
- [63] Continuation-in-part of Ser. No. 131,333, April 5, 1971, Pat. No. 3,773,111, and Ser. No. 400,623, Sept. 25, 1973, and Ser. No. 400,640, Sept. 25, 1973.
- [52] U.S. Cl. **169/59; 169/65; 169/26; 169/33**
- [51] Int. Cl. **A62c 35/02**
- [58] Field of Search..... 169/26, 2 R, 28, 30, 31 R, 169/33, 65, 59

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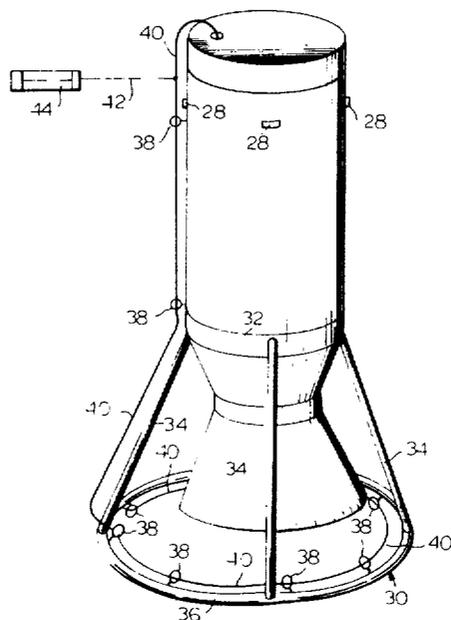
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having a plurality of individual cooking units which includes a plurality of individual extinguishing systems equal in number to the number of cooking units, each of the extinguishing systems including a container, a dry, chemical extinguishing agent disposed in the container, such as a mixture of about 50 to 95% by weight of an alkali metal carbonate, an alkali metal bicarbonate, an alkaline earth metal carbonate, an alkaline earth metal bicarbonate or mixtures thereof and about 50 to 5% by weight and sufficient to prevent reignition of an extinguished flame of a synthetic metal silicate, distributing means, such as a distributing nozzle, operatively mounted on the container and adapted to distribute the extinguishing agent over the cooking unit to be protected, propellant means, such as a bottle of a normally gaseous material under pressure, within the container adapted to generate a gas pressure on the extinguishing agent sufficient to force the extinguishing agent through the distributing means and a flame-responsive ignition means resistant to spontaneous ignition at temperatures encountered above the cooking unit to be protected, such as a fuse wire of aluminum or magnesium and a noble metal, operatively connected to the propellant means to actuate the propellant means and cause it to generate gas pressure and extending from the container and freely exposed in the area above the cooking unit to be protected. The ignition means may be connected in an electrical circuit controlling the cooking unit to automatically turn off the cooking unit when the ignition means burns.

[57] **ABSTRACT**
 A fire extinguishing system for a cooking complex

8 Claims, 14 Drawing Figures



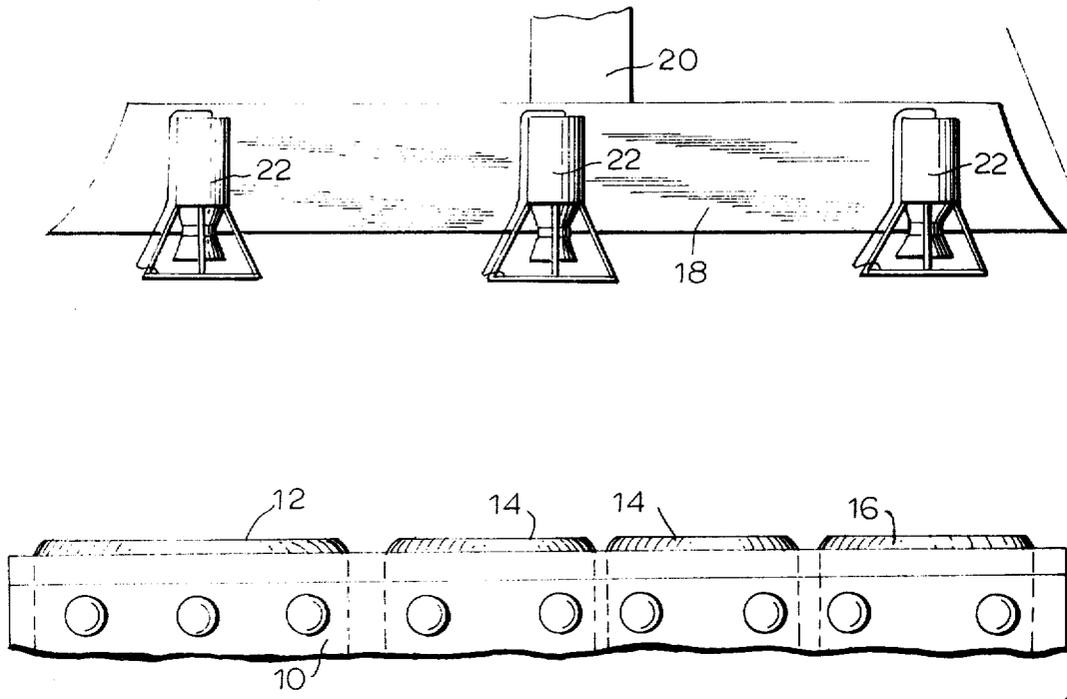


FIG. 1

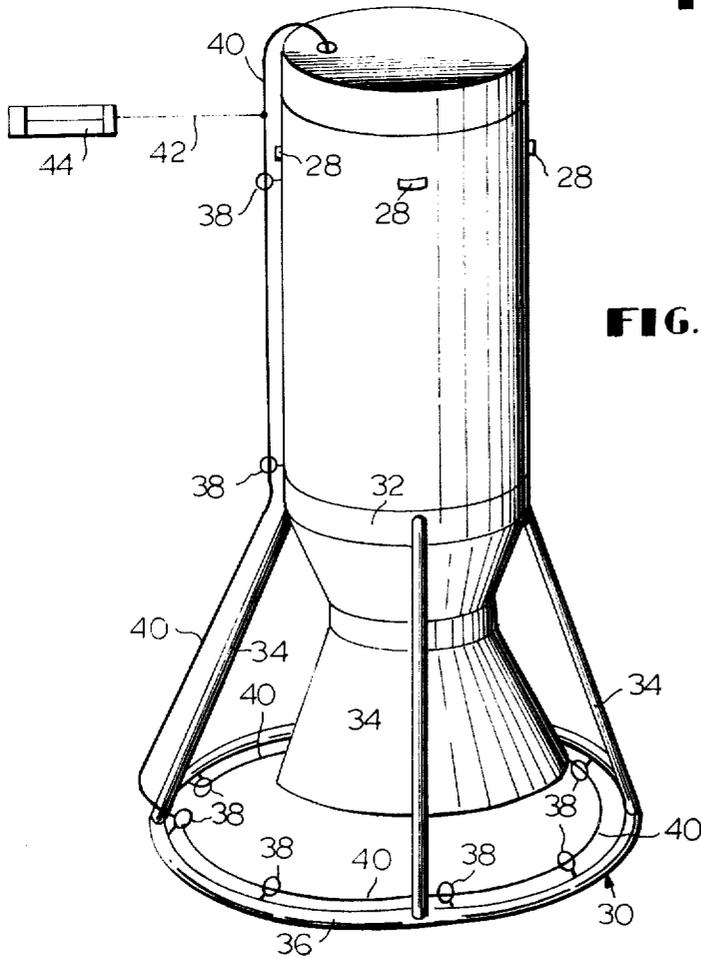


FIG. 2

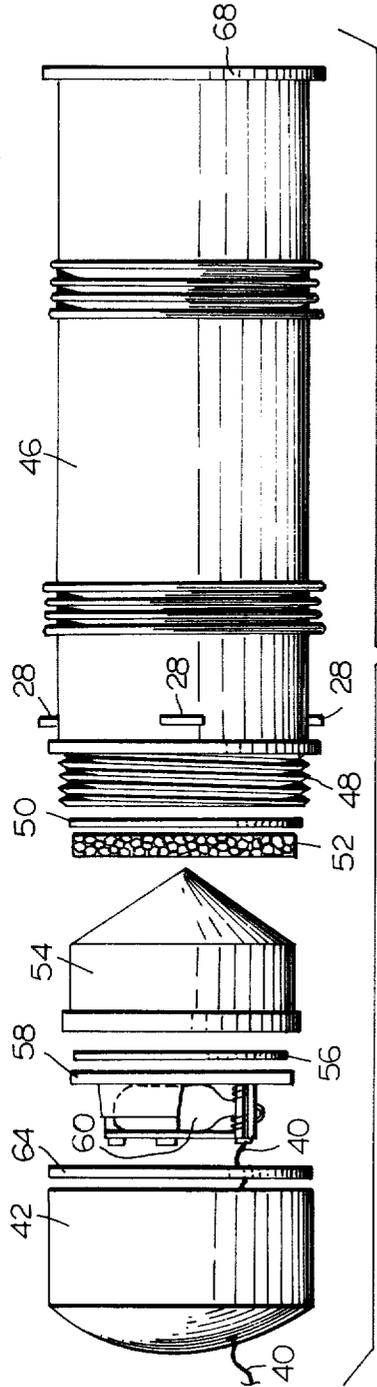


FIG. 3

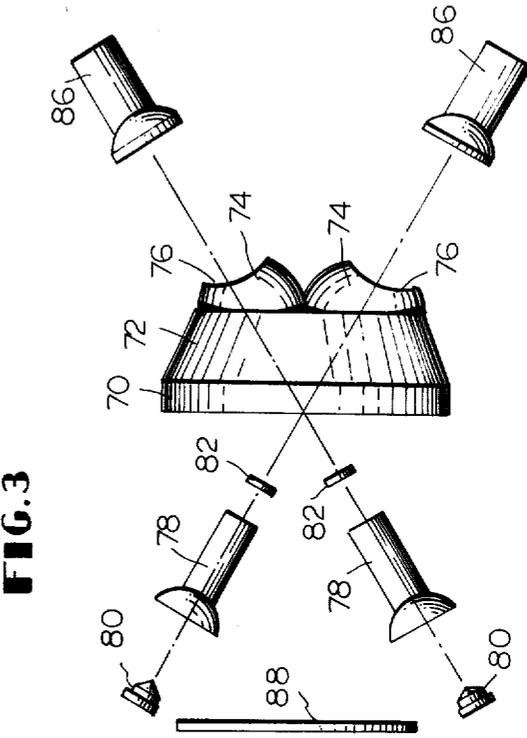


FIG. 4

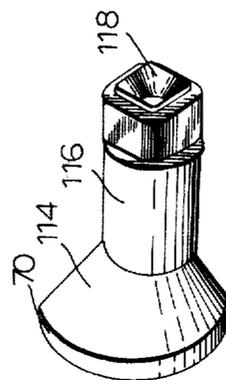


FIG. 9

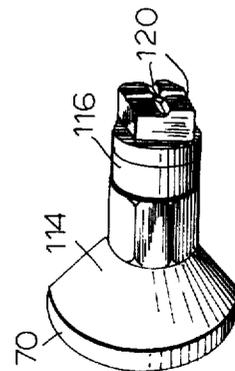


FIG. 10

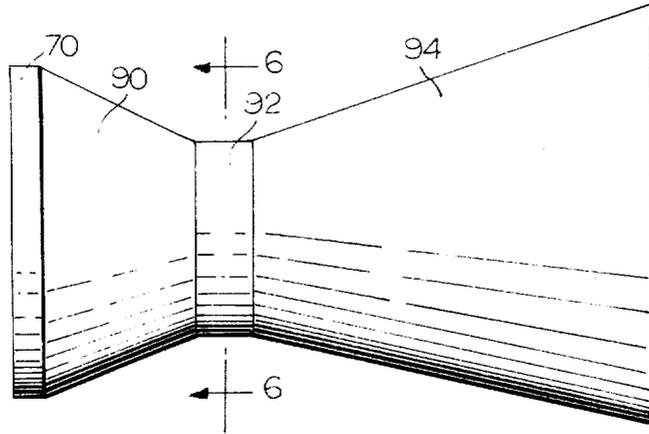


FIG. 5

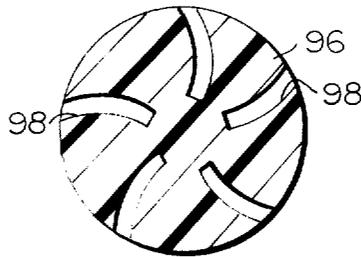


FIG. 6

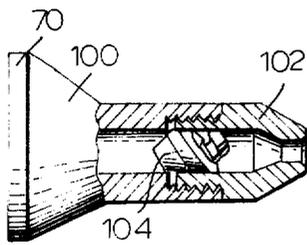


FIG. 7

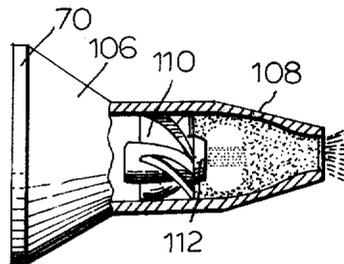


FIG. 8

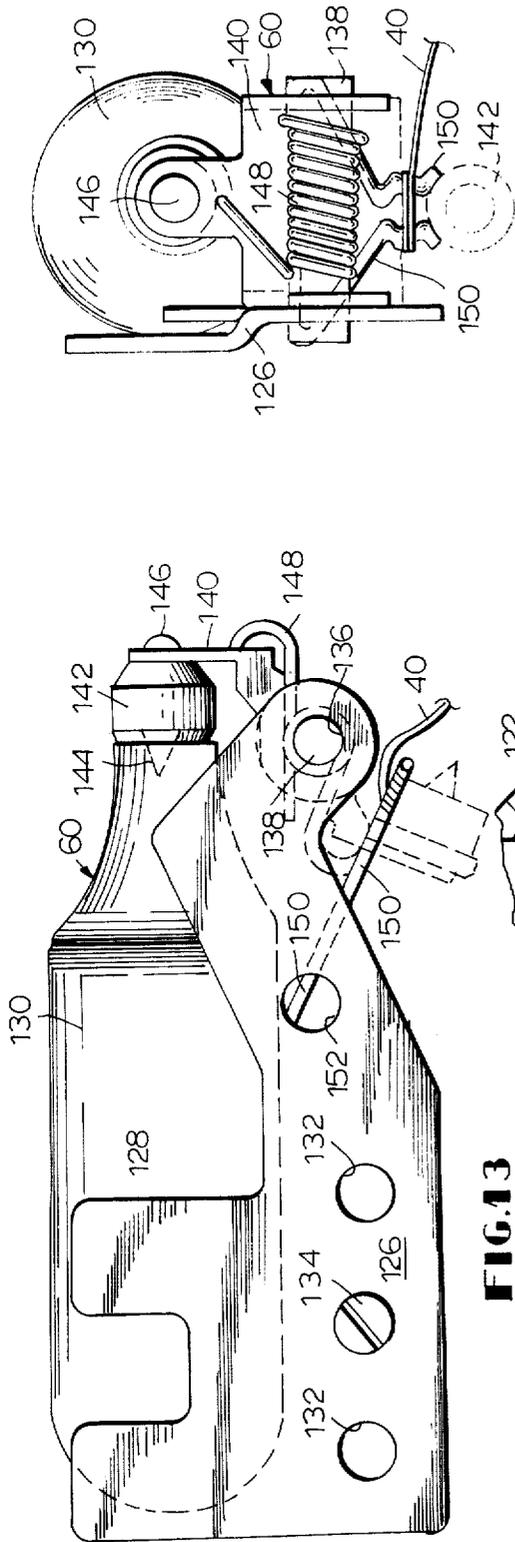


FIG. 13

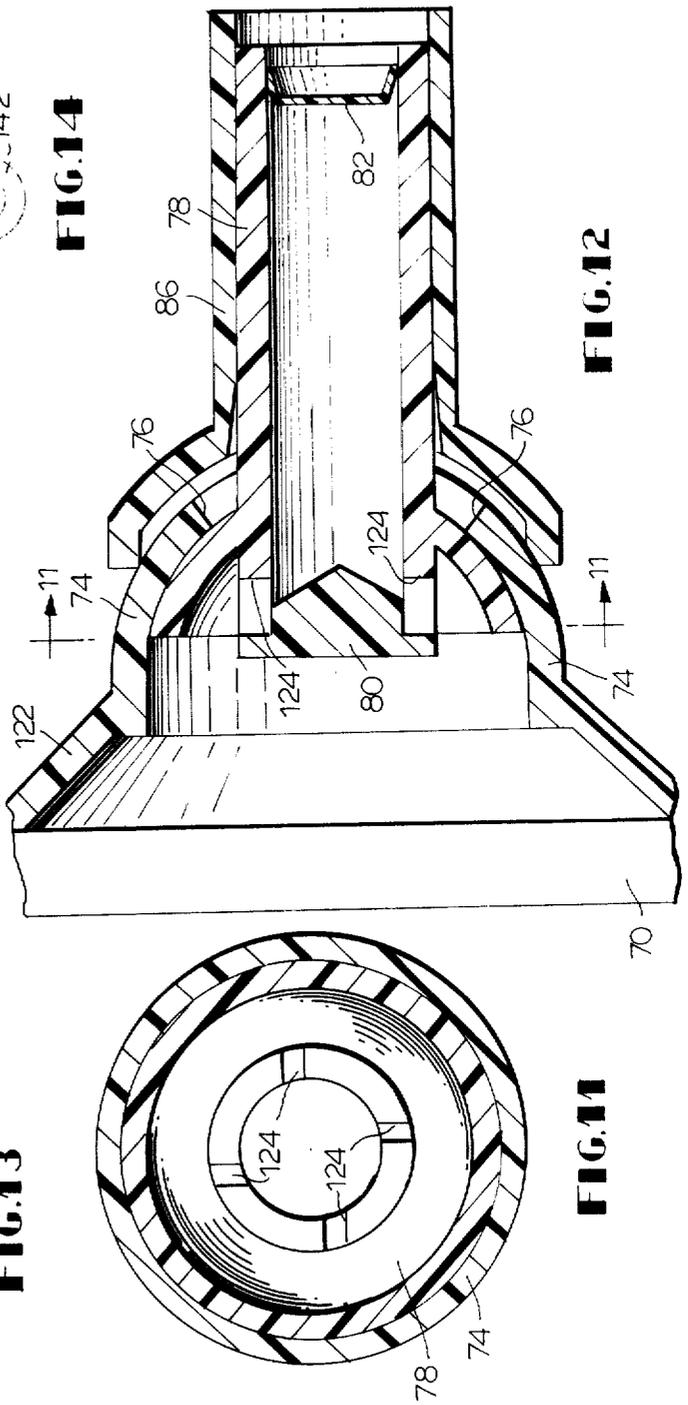


FIG. 11



FIG. 12

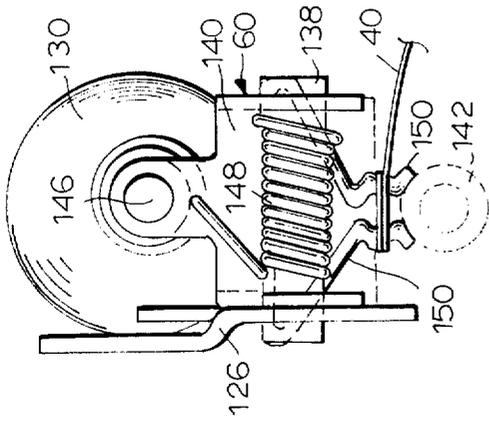


FIG. 14

COMMERCIAL COOKING UNIT FIRE EXTINGUISHER

REFERENCES TO RELATED APPLICATIONS

The present application is a continuation-in-part of applications Ser. No. 131,333, filed Apr. 5, 1971, now U.S. Pat. No. 3,773,111; Ser. No. 400,623, filed Sept. 25, 1973 and Ser. No. 400,640, filed Sept. 25, 1973, all by the present inventor. These prior applications are incorporated herein by reference.

BACKGROUND OF THE INVENTION

The present invention relates to an automatic fire extinguishing system actuatable by a flame as opposed to heat. More particularly, the present invention relates to a fire extinguishing system actuatable by a flame as opposed to heat, particularly for mounting over individual cooking units in restaurants, galleys and the like where it is not desired to close down the entire operation as a result of a grease fire on a single section of the cooking complex.

Fire extinguishing systems and compositions are generally designed for extinguishing incipient fires. Incipient fires are divided into three general classes; namely, Class A, Class B and Class C. Class A fires are those occurring in ordinary combustible material where the quenching and cooling effects of large quantities of water or solutions containing a large percentage of water are effective. This, of course, is the least difficult type of fire to extinguish. Class B fires are those occurring in oils, greases, flammable liquids, etc. where blanketing or smothering by the extinguishing agent is of greatest importance. In this type of fire, liquid extinguishing materials are generally useless, particularly since they cause splattering, etc. of the liquid material which is aflame. Fires of this type are also the most difficult to extinguish since it is also necessary that the heat be cut off after the fire is initially extinguished so that the fire will not flashback or reignite in the burning liquid. Hence, a fire extinguishing system for this type of fire must not only extinguish the original flame in a very short time but must have a holding capacity to maintain this condition and prevent or abate flashback or reignition. Class C fires are incipient fires in electrical equipment where the nonconducting property of the extinguishing material is of prime importance. In this particular case, dry fire extinguishing agents are also more useful than liquid types of their nonconducting properties. Consequently, the same types of fire extinguishing materials as are useful for Class B fires are generally best for Class C fires.

While a large number of fire extinguishers and fire extinguishing systems have been developed and are available on the market, numerous problems arise in connection with such fire extinguishers and fire extinguishing systems. These problems are particularly apparent in the operation of such devices, particularly for Class B fires in oils, greases, flammable liquids, etc. where blanketing or smothering by the extinguishing agent is of great importance.

One of the most prevalent sources of incipient fires and one of the most potentially dangerous are grease fires occurring on cooking units, particularly in commercial cooking complexes, such as restaurant kitchens, galleys of marine vessels, etc. The frequency and potential danger of such fires is widely recognized, yet there is no real present solution to the problem. The

danger of such fires has, in fact, led to current regulations which prohibit frying in the galleys of a submarine. The dangers and inconveniences associated with this type of fire in a restaurant are also quite apparent.

In fact, such fires have been known to occur as often as once a month and even once a week in the kitchen of a single restaurant, in spite of the fact that the best known extinguishing systems and protection devices are installed. Obviously, when such a fire occurs in a restaurant, it is necessary to at least temporarily cease operations for minor repairs and, at the very least, to clean up the debris left as a result of the extinguishing system actuation. Normally, this will require at least a day, thus involving a substantial loss of revenue to the restaurant owner.

There are, of course, portable fire extinguishers designed for incipient fire protection which, of course, are adapted to extinguish the fire before a large conflagration develops. Such extinguishers have numerous drawbacks in use. First of all, they are not automatic and must be operated by hand in some fashion or another. This requirement of hand operation causes considerable delay in extinguishing the fire, to the extent that the operator is usually not familiar with the operation and usually must read directions attached to the extinguisher before using it. Also, because of unfamiliarity with the operation of the device, the operator often completely misses the area of the fire by pointing the nozzle in the wrong direction and thereby wastes a substantial amount of the extinguishing agent as well as wasting further valuable time. In addition, such portable extinguishers are not permanently located at the area to be protected and usually they are in the wrong place when needed. Obviously, such hand extinguishers are not suited for the extinguishment of grease fires on commercial cooking units. While fire regulations in many areas require that they be located at strategic locations as standby or auxiliary units, this is the only purpose they serve and, in most cases, they are never used.

Automatic fire extinguishing systems have also been developed but such systems are extremely expensive to purchase and install and they are adapted for use where heat rather than a flame will actuate the device. Since these systems are actuated as a result of heat alone, such systems cannot be effectively utilized where considerable heat is normally generated. For example, in commercial installations, NFPA Regulation 96 sets forth certain criteria for extinguishing systems in commercial hoods mounted over a series of cooking units. For example, a tank containing anywhere from 20 to 50 pounds of dry chemical extinguishing agent usually sits on the floor adjacent the cooking area. Such tanks of dry chemical are under continuous pressure. This, in and of itself, is a dangerous situation since there is always the possibility of the tank leaking thereby rendering the system ineffective or of the tank exploding or bursting under certain conditions. Further, permanent plumbing normally leads from the tank to the hood and is deployed around the hood. At prescribed distances along this plumbing, spray nozzles are incorporated which point downwardly over the cooking area and a similar spray nozzle is pointed upwardly into the exhaust. Thus, one very distinct disadvantage is the fact that when the unit is set off, the entire cooking area is covered with extinguishing agent, even though only a small section or unit is actually involved in the fire.

This, of course, leads to unnecessary expense and unnecessary cleanup and interruption of operations. It would therefore be highly desirable if it were possible to extinguish a fire; for example, on a deep fryer unit while leaving undisturbed a grill or other cooking surface which is not involved in the fire. There is, of course, the usual waste of food when the entire area is blanketed with extinguishing agent plus the necessity of shutting down the entire system and cleaning up the entire cooking complex. It is also required that such systems be provided with an automatic shut-off system to shut-off the burners of the entire cooking complex. This is true since commercially available dry chemical fire extinguishing agents are incapable of preventing flashback once the fire has been extinguished. It would therefore also be highly desirable if such shut-off could be eliminated or at least confined to an individual cooking unit of the complex. Another major problem with such extinguishing systems is that they are actuated by melting a fusible link in the nozzles. While such fusible links are designed to melt at 360°F, for example, this is a very unreliable method of actuation. For example, it has been known that such fusible links can become coated with grease, lint, etc. and therefore insulated from the heat. As a result, the system will not be actuated even though a fire does occur, and, in many instances, the system has been found completely intact, never having been actuated, even though the entire building has burned down. On the other side of the coin, a fusible link can be actuated even though there is no fire. For example, it has also been known that in a number of cases the system has been actuated simply because the air conditioning system malfunctioned causing excessive heat in the hood. There is obviously also the disadvantage that a system of dry chemical extinguishing agent under continuous pressure will have a tendency to cake and plug the plumbing or the nozzles after a period of installation. This is particularly true over cooking units where substantial amounts of heat and moisture are generated. Thus, although such systems are required, and are the best known systems, they are not wholly adequate and do not solve all the problems involved. They simply do the best that can be done at present.

While systems of the type previously described utilize dry chemical fire extinguishing materials, and such materials are quite useful in extinguishing Class B fires, they have not been found to be completely adequate. The dry chemical agents are generally required for Class B fires because of the fact that these finely divided powders or dusts generally do not cause splattering of the flaming oil or grease and have a blanketing effect. While potassium aluminum fluoride and mono- and di-ammonium phosphates have certain advantages over the more common types of dry chemical fire extinguishing materials, the former materials are substantially more expensive. Therefore, the ideal and most effective materials in this category are the alkali metal bicarbonates and the alkaline earth metal carbonates, such as sodium and potassium bicarbonates and calcium carbonate. The alkaline earth metal carbonates and the alkali metal bicarbonates release carbon dioxide when the extinguishing material is heated by the flame of the burning material. This carbon dioxide is, of course, heavier than air and blankets the flaming material, thus, preventing access to ambient air. One drawback of such dry-type chemical extinguishing

agents is their tendency to cake or agglomerate when subjected to moisture, even of the atmosphere, over long periods of time. Consequently, the free-flowing character of the material is reduced so that it may be difficult to expel it from the extinguishing system when needed. This problem, however, has been satisfactorily solved by the addition of very small amounts of dessicants, such as calcium stearate, magnesium stearate, talc, silica, silica gel, diatomaceous earth, calcium chloride, etc. While such dry fire extinguishing agents, particularly the carbonates and bicarbonates, are quite effective in initially extinguishing Class B fires, it has been found that these materials alone lack the capacity of holding the extinguished condition and preventing or abating flashback or reignition. Such flashback or reignition generally follows if the heat is not cut off beneath the cooking unit, since it has been found that the temperature after the fire has been extinguished is substantially higher than the ignition temperature of the grease or oil and also above the initial ignition temperature. Thus, as previously pointed out, commercial installations are required to have an automatic cutoff to automatically turn off the burners in the event that a fire occurs on the surface. Such cutoffs, of course, must be electrically operated to shut off the power on electrical units or to operate an electrical shutoff valve in gas-fired units. Here again, there is substantial added expense which it would be highly desirable to eliminate.

SUMMARY OF THE INVENTION

The present invention relates to the protection against fire of a cooking complex having a plurality of different cooking units in which a plurality of individual extinguishing systems are mounted above the cooking units and each of the extinguishing units comprises a container adapted to hold a dry chemical extinguishing agent, distributing means for distributing the extinguishing agent over the area to be protected, propellant means within the container adapted to generate a gas pressure on the fire extinguishing agent sufficient to force the fire extinguishing agent through said distributing means, actuating means within the container operatively associated with the propellant means and adapted to energize said propellant means and cause said propellant means to generate gas pressure on the fire extinguishing agent and a flame-responsive fuse means resistant to spontaneous ignition at temperatures normally encountered in the area to be protected, operatively connected to the actuating means to actuate the actuating means and disposed above and about the area to be protected. The dry chemical extinguishing agent is preferably a mixture of an alkali or alkaline earth metal carbonate or bicarbonate and a metal silicate, the means for generating a gas pressure is preferably a container of carbon dioxide under pressure, the gas pressure preferably acts upon a piston adapted to displace the extinguishing agent and the carbon dioxide is preferably released by ignition of a fuse wire having from 80 to 20 parts by volume of platinum or palladium and from 20 to 80 parts by volume of aluminum or magnesium. The fuse wire is deployed above and about the area to be protected by deploying the fuse wire about an open frame means suspended from the extinguishing agent container.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 of the drawings is a front view, partially in section, of the modular fire extinguishing system of the present invention installed in a hood over a commercial cooking complex;

FIG. 2 is a perspective view of an individual extinguisher as shown in FIG. 1;

FIG. 3 is an exploded view of a cannister assembly for holding fire extinguishing agent and discharging the same in accordance with the previous Figures;

FIG. 4 shows one form of dispersing means for the fire extinguisher of FIG. 2;

FIG. 5 is a side view of a second nozzle means useful in accordance with the present invention;

FIG. 6 is a cross-section along the line 6—6 of FIG. 5;

FIG. 7 is a perspective view, partially in section, of another form of nozzle means for use in the present invention;

FIG. 8 is a side view, partially in section, of still another nozzle means for use in the present invention;

FIGS. 9 and 10 show still further embodiments of nozzle means for use in the present invention adapted to distribute extinguishing agent in a square pattern;

FIG. 11 is an end view, partially in section, taken along the line 12—12 of FIG. 12 and showing still another nozzle means for use in the present invention;

FIG. 12 is a side, cross-sectional view, partially in section, of the nozzle means of FIG. 11;

FIG. 13 is a side view, partially in section, of actuating means and propellant means for use in accordance with the present invention;

FIG. 14 is a top view of the actuation and propellant means of FIG. 13.

DETAILED DESCRIPTION OF THE INVENTION

In accordance with FIG. 1 of the drawings, the numeral 10 refers to a cooking range of conventional construction for commercial use and containing individual cooking units comprising a grill 12, a plurality of individual burners 14 and a deep fryer 16. Mounted above the cooking complex 10 is a vent hood 18 provided with a vent pipe 20. Mounted in hood 18 above the cooking units 12, 14 and 16, respectively, are a plurality of extinguishing units 22. As will be pointed out hereinafter, the individual or modular extinguishing units 22 are adapted and designed to cover an individual cooking unit or section, such as units 12, 14 and 16 and to automatically extinguish a fire occurring on any one of the individual units without in any way affecting the operation or use of the other units of the complex.

FIG. 2 shows a more detailed view of one of the modular extinguishing units 22. The extinguisher of FIG. 2 comprises a cannister 24 adapted to contain the fire extinguishing agent plus the means for discharging the same. The cannister 24 terminates at its lower end in a distributing nozzle means 26 having a flared bottom. Mounted adjacent the upper end of cannister 24 are a plurality of hangers 28 for mounting the extinguisher above the cooking complex. Attached to the lower end of the cannister 24 above the nozzle 26 is a support frame 30. Support frame 30 is made up of a metal band 32, preferably of stainless steel, downwardly depending and outwardly flaring wires 34 and wire ring 36 attached to the lower end of wires 34. Attached to ring 36 is a plurality of eyelets or hooks 38. Threaded

through the eyelets 38 and passing around the ring 36 is ignition wire or fuse 40. After passing about the ring 36, the wire 40 passes upwardly along the side of the extinguisher and thence into the top of cannister 24 as will be explained in more detail hereinafter. Since, as previously indicated, it is sometimes required or desirable to turn off a cooking unit if a fire occurs, an extension of ignition wire 40 comprising the wire 42 of the same material passes to an electrical shut-off means 44. In the present illustration, the electrical shut-off means is a conventional fuse having as a fuse element a portion of the same wire utilized as the ignition wire for the extinguisher. The shut-off 44 may take a variety of forms. It may be a simple fuse mounted in the input circuit of an electrical range, a fuse mounted in the electrical circuit of an electrically-operated gas shut-off valve in a gas cooking unit or any of a variety of other known means. It is preferred, however, that a simple fuse utilizing the same wire as is utilized as ignition wire 40 be used. The ignition, as well as the fuse wire, preferably comprises a mixture of superimposed layers of from about 80 to 20 parts by volume of platinum or palladium and from 20 to 80 parts by 1,200° of aluminum or magnesium. Such a wire makes an excellent electrical fuse element. In addition, it has numerous distinct advantages when utilized in the present invention. Specifically, the wire will not ignite by heat alone under the conditions normally encountered in cooking units. The wire normally will not ignite or burn at radiant heat temperatures as high as 1200°F but will ignite instantaneously and burn rapidly at a rate of about 0.9 foot per second when contacted by a flame. A suitable wire of this type is manufactured by Pyrofuse Company of Mount Vernon, New York and is known as "PYROFUZE." This ignition wire or sensor wire is a coaxially braided material having an aluminum core and a palladium outer shell. Platinum may also be used as the shell material. The wire is preferably about 0.004 inch diameter and withstands a breaking load of about 9 pounds.

Except for the support bracket 30 and the hangers 28, the extinguisher 22 is preferably made of a material having a high degree of toughness, impact strength, heat resistance and dimensional stability as well as good electrical properties. While there are a number of metallic or plastic and resinous materials which can be utilized, the preferred material is "Lexan 101," manufactured by the General Electric Company. This material is a thermoplastic polycarbonate resin suitable for use in molded or extruded structures and exhibits all of the desirable properties specified above. Any other parts of the device which are metallic are preferably zinc- or cadmium-plated ferrous parts or stainless steel. When parts of the system are to be bonded together, such as, the nozzle retainer to the distributing nozzle, the piston insert to the piston, the nozzle base to the cannister assembly, the cannister to the cannister support, etc., this can be accomplished by the use of a suitable solvent for the "Lexan," such as ethylene dichloride.

FIG. 3 of the drawings shows an exploded view of the cannister assembly 24 of the fire extinguishing system of the present application. In FIG. 3, a main tubular body portion 46 is provided. Body portion 46 is threaded at its rear end portion 48. Mounted inside tubular body 30 adjacent the front end thereof and resting against a reduced shoulder therein is a frangible disc 50. The tubular body 46 is packed with a dry

chemical fire extinguishing agent 52. Thereafter, a piston assembly 54 is positioned in tubular body 46. The rear end of tubular body portion 46 is then closed by means of frangible disc 56 mounted on an actuator plate 58. Actuator 58 has mounted thereon actuator assembly 60. Actuator plate 58 rests on a shoulder in the end cap assembly 62. Cap 62 is screwed on portion 48 of tubular body 46 and sealed by means of O-ring 64. Passing from the actuator assembly 60 through the back of end cap 62 is ignition or sensor wire 40. Formed on the front end of cannister body 46 is male portion 68 of the bayonet-type connector. This bayonet connector connects with a female portion of a bayonet connector formed on the nozzle assembly.

FIG. 4 of the drawings shows a suitable nozzle assembly for use with the cannister assembly 24 of FIG. 3. The nozzle assembly includes a female portion 70 of a bayonet connector which latches over male portion 68 of FIG. 3. A converging conical portion 72 is attached to female portion 70 of the bayonet connector and terminates in a plurality of hemispherical nozzle supports 74. Passing through apertures 76 of nozzle support 74 are distributing nozzles 78. Distributing nozzles 78 have mounted in their upper ends nozzle deflectors 80 and their lower ends temporary nozzle seals 82. The free ends of distributing nozzles 78 which pass through apertures 76 have slidably mounted on the outside thereof nozzle retainers 86. Nozzles 78 are press-fit in nozzle retainers 86 in such a fashion that they may be pivoted over a wide angle about hemispherical portions 74. The two portions 68 and 70 of the bayonet connection are sealed together by means of O-ring 88.

FIGS. 5 and 6 show another form of a single nozzle which may be utilized in accordance with the present invention. This nozzle comprises a female portion 70 of a bayonet connector adapted to attach to the male portion 68 of FIG. 3, a converging conical portion 90 which is adapted to receive the piston 54 when it has reached the forward extremity of the cannister assembly, a neck portion 92 and a diverging conical or bell portion 94. Mounted in the neck portion 92 of the nozzle assembly of FIG. 5 is a distributor disc 96. Distributor disc 96 is provided with curvilinear slots 98 which extend from the edge of the disc 96 inwardly to a point adjacent the center of disc 96. Distributor disc 96 provides a swirling motion to the extinguishing agent as it is forced from the cannister assembly and thereby aids in the distribution of the extinguishing agent.

FIG. 7 shows a nozzle assembly which also is adapted to distribute extinguishing agent in a solid conical spray. This nozzle assembly comprises a female portion 70 having a converging conical portion 100 which terminates in a nozzle means 102. Mounted in the interior of nozzle 102 is a deflector distributing means 104.

FIG. 8 of the drawings shows yet another nozzle for distributing extinguishing agent in a solid conical pattern. This nozzle assembly is made up of female portion 70 of a bayonet connector and inwardly converging conical section 106 and a nozzle 108. Mounted within the nozzle 108 are deflector fins 110 and a jet means 112 provided with an aperture through its center.

FIGS. 9 and 10 of the drawings show nozzles of the type illustrated in FIGS. 7 and 8 which are adapted to spray the extinguishing agent in a solid, square-shaped or pyramid pattern. The nozzles of FIGS. 9 and 10 comprise the female portion 70 of the bayonet connection, inwardly converging conical portion 114 and body

portion 116. The body portions 116 are provided with deflecting means of either the type shown in FIGS. 7 or 8. The square pattern of discharge is provided by the generally square depression 118 in FIG. 9 or the cross V grooves 120 of FIG. 10.

FIGS. 11 and 12 show the detail of the nozzle assembly of FIG. 4. It should be recognized, as shown in FIG. 12, that one of these nozzles can be enlarged and connected to a converging conical portion 122 which can be connected to the end of the cannister body 46 of FIG. 3 so that a single large nozzle of this type may be employed. The advantage of this type of nozzle lies in its simplicity and freedom from plugging and the like when utilizing the powder-form chemical extinguishing agent. As shown in FIGS. 11 and 12, apertures 124 are formed in the top sides of nozzle 74 in which they are disposed parallel to the radii of the nozzle and offset therefrom. By this placement of the openings, the powdered fire extinguishing agent exits through nozzle 74 in a swirling or vortical motion due to the coaction of and the placement of the apertures 124 with respect to the deflector 80. This has a critical effect on the distribution of the powdered extinguishing agent over the area to be protected.

FIGS. 13 and 14 of the drawings show the actuator assembly-propellant means 60 in detail. Assembly 60 is held in place on actuator plate 58 (FIG. 3) by means of actuator bracket 126. Actuator bracket 126 is provided with a flange portion 128 which extends over and holds a pressurized gas bottle 130. The pressurized gas bottle, as previously indicated, contains liquified CO₂ and is of the type used in "Mae West" life jackets. This component is designated by the U.S. Military as MIL-C-61B, type I. Actuator bracket 126 is provided with apertures 130 which fit over posts (not shown) on the actuator plate 58. A screw 132 holds the bracket 126 on actuator plate 58. Actuator bracket 126 is provided with an aperture 136 which receives pivot pin 138. Mounted on pivot pin 138 is hammer bracket 140. Hammer bracket 140 carries hammer 142 with puncturing pin 144. The puncturing pin is so aligned that it will puncture the seal of the gas bottle 130 at an appropriate time. Hammer 142 is manufactured as a separate entity from the hammer bracket 140 and is attached thereto by swaging a central post 146. Pivot pin 138 also carries a helical power spring 148 which has one end thereof resting on top of hammer bracket 140 and the other end thereof resting against a post (not shown) of actuator plate 58. The solid line outline of hammer bracket 140, hammer 142 and spring 148 show the active or released position of these elements. Shown in dashed lines is the cocked or inactive position of the hammer bracket 140, hammer 142 and spring 148. Hammer bracket 140 is held in the cocked position by means of a clip 150. Clip 150 is held in place by having two side extensions thereof pass into an aperture 152 in bracket 126. Clip 150 is therefore free to rotate or pivot to a limited extent making it possible to align the clip with the hammer bracket 140. However, bracket 140 is thereby held in the cocked position by gripping the same between the legs of clip 150 and then wrapping sensor or ignition wire 40 about the free ends of the clip. Thus, it is obvious that the actuator, once cocked, will operate as follows: The sensor 40 will burn releasing the tension on clip 150. Clip 150 will thereby release hammer bracket 136 which is driven by power spring 148. In the extreme hammer bracket 140 will as-

sume the position shown in solid lines with the hammer **142** against the end of the gas bottle **130** and the puncturing pin **144** through the seal of the gas bottle **130**.

The preferred fire extinguishing material for use in the present invention not only rapidly extinguishes the original flame but holds this condition and prevents or abates flashback or reignition even if the burner of the range is left on. This is detailed in copending applications Ser. Nos. 400,623 and 400,640 and reference is made thereto. The fire extinguishing agent of the present invention is a synergistic mixture of about 50 to 95% by weight of an alkali metal carbonate, an alkaline earth metal carbonate, an alkali metal bicarbonate or an alkaline earth metal bicarbonate and about 50 to 5% by weight of a metal silicate. Because of its availability, effectiveness and freedom from toxicity, the preferred carbonate is sodium bicarbonate. Preferably, the sodium bicarbonate is present in amounts between about 85 and 60% by weight of the composition. Specifically, the most desirable composition contains about 78% to 80% by weight of sodium bicarbonate. The metal silicate is preferably a nontoxic alkali metal or alkaline earth metal silicate and of a substantially pure character, such as, a material manufactured by precipitation. A highly effective silicate for use in accordance with the present invention is "Silene L," manufactured by Pittsburgh Plate Glass Company, Pittsburgh, Pennsylvania. This material is a precipitated calcium silicate and has an approximate analysis of CaO 19% and SiO₂ 57%; and a loss on ignition of about 14%. It has a specific gravity of about 2.1 and bulk density of about 15 to 16 pounds per cubic foot. The preferred range of silicate is in the amount of 15 to 40% by weight and, specifically, the most effective has been found to be about 19% to 20% by weight. The composition may also include minor amounts of, up to about 5% by weight of conventional desiccants, lubricants, adsorbents and the like. Suitable materials of this character include calcium chloride, diatomaceous earth, silica gel, calcium stearate, etc. and preferably are present in an amount of about 3%. Calcium stearate is a preferred desiccant. However, this last component is not necessary to the synergistic effect of the mixture of the present invention nor to its free-flowing properties. It has been found in accordance with the present invention that the mixture of bicarbonate and silicate has free-flowing characteristics making its discharge from a suitable extinguishing apparatus superior to most conventional extinguishing agents. It also resists stratification in storage and in the extinguishing apparatus. The mixture is also capable of withstanding extreme temperatures without deterioration, thereby providing long shelf life and useful life without recharging or replacement and is relatively resistant to moisture deterioration. The dry, chemical fire extinguishing agent of the present invention is packed in body **24** of the cannister between frangible discs **50** and **56** by vibration of the cannister and is the only known dry, chemical extinguishing agent which can be loaded in this manner. This packing of the extinguishing agent has been approved by Underwriters' Laboratories and, as indicated, is the only material approved for packing in this manner. This, of course, also contributes to non-stratification.

While specific examples and structures have been described and illustrated herein, it is to be understood that modifications thereof will be obvious to one skilled in the art. Accordingly, the present invention is to be

limited only in accordance with the appended claims.

I claim:

1. A fire extinguishing system for a cooking complex having a plurality of individual cooking units, comprising, a plurality of individual extinguishing systems equal in number to the number of said cooking units, each of said extinguishing systems, comprising, a container, a dry, chemical extinguishing agent disposed in said container, distributing means operatively mounted on said container and adapted to distribute said extinguishing agent over the cooking unit to be protected, propellant means within said container adapted to generate a gas pressure on said extinguishing agent sufficient to force said extinguishing agent through said distributing means, an open frame structure surrounding said distributing means, and a flame-responsive ignition means resistant to spontaneous ignition at temperatures encountered above said cooking unit to be protected, operatively connected to said propellant means to actuate said propellant means and cause it to generate gas pressure and disposed about said open frame structure.

2. A fire extinguishing system for a cooking complex having a plurality of individual cooking units, comprising a plurality of individual extinguishing systems equal in number to the number of said cooking units, each of said extinguishing systems, comprising, a generally cylindrical container, a dry, chemical extinguishing agent disposed in said container, distributing means operatively mounted on said container and adapted to distribute said extinguishing agent over the cooking unit to be protected, propellant means within said container including a gas generating means and a gas-impervious piston means between said gas generating means and said extinguishing agent and in gas-tight engagement with the walls of said container and adapted to generate a gas pressure on said piston means sufficient to force said extinguishing agent through said distributing means and a flame-responsive ignition means resistant to spontaneous ignition at temperatures encountered above said cooking unit to be protected, operatively connected to said propellant means to actuate said propellant means and cause it to generate gas pressure and extending from said container and freely exposed in the area above said cooking unit to be protected.

3. A fire extinguishing system for a cooking complex having a plurality of individual cooking units, comprising, a plurality of individual extinguishing systems equal in number to the number of said cooking units, each of said extinguishing systems, comprising, a container, a dry, chemical extinguishing agent disposed in said container, distributing means including a disc having a plurality of curved slots each leading from the edge of said disc toward the center thereof and outwardly diverging horn means extending from said disc, operatively mounted on said container and adapted to distribute said extinguishing agent over said cooking unit to be protected, propellant means within said container adapted to generate a gas pressure on said extinguishing agent sufficient to force said extinguishing agent through said distributing means and a flame-responsive ignition means resistant to spontaneous ignition at temperatures encountered above said cooking unit to be protected, operatively connected to said propellant means to actuate said propellant means and cause it to generate gas pressure and extending from

said container and freely exposed in the area above said cooking unit to be protected.

4. A fire extinguishing system for a cooking complex having a plurality of individual cooking units, comprising, a plurality of individual extinguishing systems equal in number to the number of said cooking units, each of said extinguishing systems, comprising, a container, a dry, chemical extinguishing agent disposed in said container, distributing means operatively mounted on said container and adapted to distribute said extinguishing agent over the cooking unit to be protected, propellant means within said container adapted to generate a gas pressure on said extinguishing agent sufficient to force said extinguishing agent through said distributing means, a flame-responsive ignition means resistant to spontaneous ignition at temperatures encountered above said cooking unit to be protected, operatively connected to said propellant means to actuate said propellant means and cause it to generate gas pressure and extending from said container and freely exposed in the area above said cooking unit to be protected and also forms the fuse element of a fuse means and said fuse means is operatively mounted in an electrical circuit controlling said cooking unit to shut off said cooking unit.

5. A fire extinguishing system for a cooking complex having a plurality of individual cooking units, comprising, a plurality of individual extinguishing systems equal in number to the number of said cooking units, each of said extinguishing systems, comprising, a container, a dry, chemical extinguishing agent disposed in said container, distributing means operatively mounted on said container and adapted to distribute said extinguishing agent over said cooking unit to be protected, propellant means within said container adapted to generate a gas pressure on said extinguishing agent sufficient to force said extinguishing agent through said distributing means and a flame-responsive ignition means resistant to spontaneous ignition at temperatures encountered above said cooking unit to be protected, operatively connected to said propellant means to actuate said propellant means and cause it to generate gas pressure, extending from said container and freely exposed in the area above said cooking unit to be protected and connected to an electrical switch means mounted in an electrical circuit controlling said cooking unit to shut off said cooking unit.

6. A fire extinguishing system for a cooking complex having a plurality of individual cooking units, comprising, a plurality of individual extinguishing systems equal in number to the number of said cooking units, each of said extinguishing systems, comprising, a container, a dry, chemical extinguishing agent including a major proportion of about 50 to 95% by weight of a material selected from the group consisting of an alkali metal carbonate, an alkaline earth metal carbonate, an alkali metal bicarbonate, an alkaline earth metal bicarbonate and mixtures thereof and a minor amount of about 50 to 5% by weight and sufficient to prevent reignition of an extinguished flame on the cooking unit over which said extinguishing agent is distributed of a

synthetic metal silicate disposed in said container, distributing means operatively mounted on said container and adapted to distribute said extinguishing agent over the cooking unit to be protected, propellant means within said container adapted to generate a gas pressure on said extinguishing agent sufficient to force said extinguishing agent through said distributing means and a flame-responsive ignition means resistant to spontaneous ignition at temperatures encountered above said cooking unit to be protected, operatively connected to said propellant means to actuate said propellant means and cause it to generate gas pressure and extending from said container and freely exposed in the area above said cooking unit to be protected.

7. A fire extinguishing system for a cooking complex having a plurality of individual cooking units, comprising, a plurality of individual extinguishing systems equal in number to the number of said cooking units, each of said extinguishing systems, comprising, a container, a dry, chemical extinguishing agent disposed in said container, distributing means operatively mounted on said container and adapted to distribute said extinguishing agent over said cooking unit to be protected, propellant means within said container adapted to generate a gas pressure on said extinguishing agent sufficient to force said extinguishing agent through said distributing means and a flame-responsive ignition means resistant to spontaneous ignition at temperatures encountered above said cooking unit to be protected, including, 20 to 80% by volume of a metal selected from the group consisting of platinum and palladium and 80 to 20% by volume of a metal selected from the group consisting of aluminum and magnesium, operatively connected to said propellant means to actuate said propellant means and cause it to generate gas pressure and extending from said container and freely exposed in the area above said cooking unit to be protected.

8. A fire extinguishing system for a gas-operated cooking complex having a plurality of individual cooking units, comprising, a plurality of individual extinguishing systems equal in number to the number of said cooking units, each of said extinguishing systems, comprising, a container, a dry, chemical extinguishing agent disposed in said container, distributing means operatively mounted on said container and adapted to distribute said extinguishing agent over the cooking unit to be protected, propellant means within said container adapted to generate a gas pressure on said extinguishing agent sufficient to force said extinguishing agent through said distributing means, a flame-responsive ignition means resistant to spontaneous ignition at temperatures encountered above said cooking unit to be protected, operatively connected to said propellant means to actuate said propellant means and cause it to generate gas pressure, extending from said container and freely exposed in the area above said cooking unit to be protected and operatively connected to a gas shutoff valve controlling said cooking unit to shut off said cooking unit.

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