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FIRE EXTINGUISHING FLUID

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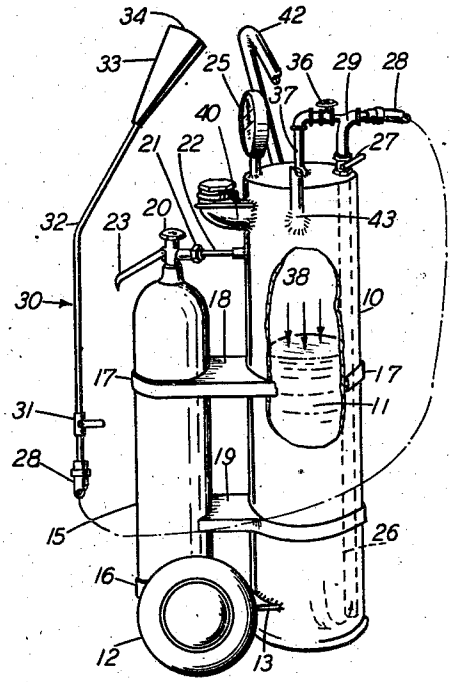


FIG — 1

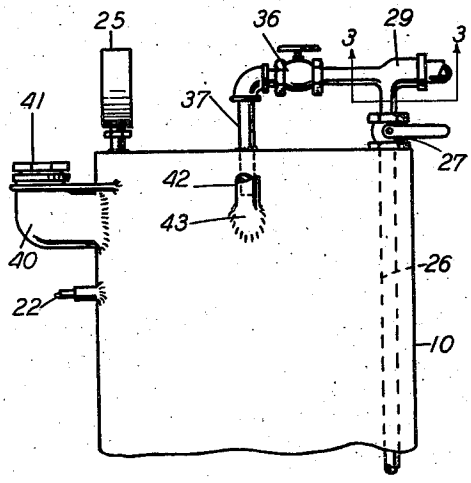


FIG — 2

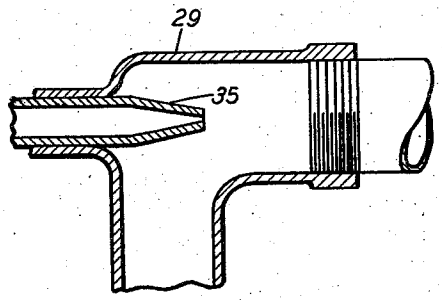


FIG — 3

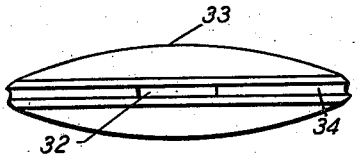


FIG — 5

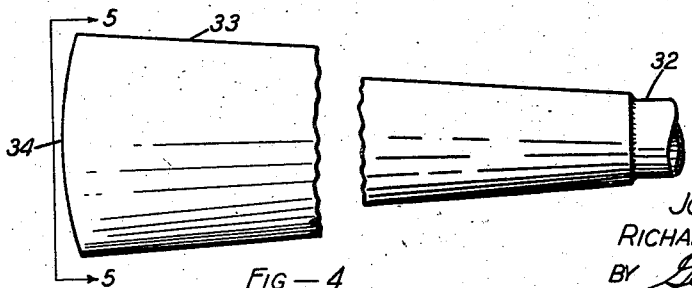


FIG — 4

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FIRE EXTINGUISHING FLUID

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4 Claims. (Cl. 252—3)

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This invention relates to fire extinguishers and more particularly to apparatus and compositions for extinguishing fires in finely divided metals such as magnesium, aluminum, calcium, sodium, potassium and the like metals and their various alloys.

A number of these metals and their alloys, particularly magnesium and aluminum are extensively used in the automobile, aircraft and armaments industries and in performing the machining operations, for example, in turning, drilling and grinding these metals, large quantities of chips, shavings and finely divided metallic powder is formed which is highly inflammable and often catches fire and burns violently. Such fires are extremely difficult to extinguish and heretofore have often resulted in the loss of the entire body of the metal and also on occasions the simultaneous loss of the valuable machinery and associated equipment by means of which these metals are being worked.

Incendiary bombs composed of magnesium, aluminum and sodium are similarly difficult to extinguish.

Such fires as those beforementioned cannot be extinguished by the common type of fire extinguisher fluids such as water, carbon dioxide, and carbon tetrachloride, for these chemicals dissociate in the presence of the incandescent metals and appear to vigorously support combustion to the extent of actually intensifying the heat and rate of combustion. In the case of application of water or steam, for example, the combustion of magnesium becomes practically explosive.

One method which has been attempted in some cases is to cover the burning metal with finely divided solids or powders. For example, such materials as sand, clay, slate powder, calcium carbonate or marble dust, china clay, carbon black, graphite and the like substances have been used to attempt to cover the burning body of metal with an air-tight blanket which will exclude oxygen. However, these have proved to be unsatisfactory for the reason that the fire continues to smolder underneath such a covering and if resting upon a combustible surface such as a wooden roof or floor will rapidly burn through and moreover, any subsequent disturbance of the fire covering so formed results in immediate flash of the fire into renewed activity. Furthermore, the use of these solid materials is undesirable when the fire is associated with the machinery by which the metals are worked, for the reason that their abrasive properties in some cases would be destructive and in all cases at best damaging. The

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finely divided metal to which such solid agents are applied are also rendered substantially unfit for recovery and subsequent use by reason of the difficulty of separating the pure metal from the applied extraneous solids.

Another method which has been attempted to extinguish fires in these highly combustible metals has been to apply various oils, waxes and bituminous substances both solid and liquid in admixture with solid materials such as those above mentioned, but these mixtures have proved to be unsatisfactory for the reason, in addition to those beforementioned in connection with the finely divided solids, that they are themselves in most cases combustible and create a separate fire hazard, particularly when employed in factory buildings and houses, the wooden structures of which may become permeated with the oil, rendering them highly flammable. If the applied oil is insufficient to extinguish the burning metal or even at times succeeds in extinguishing the metal the fire of the burning metal may be replaced by a fire of burning oil or other substances.

It is an object of this invention to overcome the beforementioned disadvantages of the common type of extinguisher heretofore employed for extinguishing metal fires and to provide a fire extinguisher fluid and apparatus which may be employed freely under substantially all possible conditions to extinguish metal fires whether or not associated with inflammable buildings or with delicate machinery and which will not create a secondary fire hazard.

It has been discovered that fires in metals such as magnesium, aluminum, and the like metals, and their alloys can be readily extinguished by means of a properly applied intimate mixture of certain oils and an inert gas such as nitrogen or carbon dioxide. For example, it has been found that a mixture comprising two parts of cottonseed oil and one part castor oil by volume containing entrained finely dispersed carbon dioxide gas in sufficient quantity to form therewith a tenacious creamy fluid is particularly effective in extinguishing the beforementioned metal fires when applied in a manner to be further described hereinafter.

The apparatus of this invention for applying the fire extinguishing fluid of this invention is illustrated in the accompanying drawings in which

Figure 1 is a side view of the general assembly of the apparatus;

Figure 2 is an enlarged fragmentary elevation of the tops of the extinguisher fluid tank;

Figure 3 is an enlarged cross-section view taken on line 3—3 of Figure 2;

Figure 4 is a side view of the extinguisher fluid applicator nozzle;

Figure 5 is an end view of the applicator nozzle taken on line 5—5 of Figure 4.

In the drawings where the same reference numerals designate similar parts 10 is a cylindrical pressure tank to contain a quantity of the extinguishing fluid as illustrated at 11 and adapted to be portably supported by means of a pair of wheels 12 attached to the tank by means of a bracket 13 preferably welded thereto. A replaceable carbon dioxide containing pressure cylinder 15 is carried upon the bracket 13, the lower end of which rests in a cupped metal socket 16 which is attached to the said bracket. The said pressure cylinder 15 is clamped in an upright position adjacent the fluid-containing cylinder 10 by means of a metal band 17 which passes around both of the cylinders. Suitable spacing is retained between the cylinders by means of curve-ended spacer blocks 18 and 19. The carbon dioxide pressure cylinder 15 is connected to the upper end of the extinguisher fluid tank 10 through fittings comprising a throttle valve 20, union 21 and pressure pipe 22. The throttle valve 20 is adapted to be conveniently hand operated by means of a handle 23.

A pressure gauge 25 is provided for determining the gas pressure within the tank 10.

The extinguisher fluid outlet from the tank 10 consists of a vertically disposed siphon pipe 26 extending from valve 27 at the head of the tank 10 to a point adjacent the bottom of the tank. The said valve 27 makes connection through a specially constructed elbow 29 and a suitable length of flexible pressure oil resistant tubing or hose 28 to the applicator 30 which in turn comprises a hand valve 31 a length of curved metal piping 32 and a fan shaped nozzle tip 33. The fan nozzle which may be about three inches wide is formed with an outlet orifice in the form of a thin slot approximately $\frac{1}{16}$ inch wide and extending across the full width thereof, as shown at 34 in Figures 4 and 5.

The special elbow 29 is provided with an axially positioned jet nozzle 35 as best shown in Figure 3, which enters through the bend of the elbow and makes connection through valve 36 and piping 37 to the head of the fluid tank and to the gas space normally maintained therein, as shown at 38. A filling spout 40 having a gas tight fitting top 41 is provided in the top portion of the tank 10 for replenishing the extinguisher fluid. An inverted U shaped handle 42 attached to the top portion of the tank 10 as shown at 43 is provided for conveniently tilting the unit back upon the wheels 12 for transportation.

The operation of the apparatus is as follows: The tank 10 is filled through spout 40 with the special extinguisher fluid up to a level as shown at 11, leaving a suitable gas space thereabove as shown at 38. When it is desired to apply the extinguisher fluid to a fire the valve 20 is slightly opened, while valve 31 is maintained closed, to allow carbon dioxide gas to flow through pipe 22 into the tank gas space until a suitable pressure is built up therein as indicated by the pressure gauge 25. A gas pressure of approximately 200 pounds per square inch has been found satisfactory for most conditions of application of the fluid. The valve 20 is adjusted or opened from time to time during operation of the extinguisher apparatus to maintain this pressure.

For subsequent application of the fluid to a fire the valve 31 is opened the desired amount and valves 27 and 36 are each adjusted to allow the desired mixture of fluid and gas expelled from the bottom and the top respectively of the tank 10 to be formed within the mixing elbow 29 at the mixture jet 35. The resultant intimate mixture of expelled extinguisher fluid and gas passes out through the pressure hose to the applicator 30 and issues in a fan-shaped stream from the end of the applicator nozzle 33. The force and volume of the said extinguisher fluid stream to be applied to the fire may be adjusted by the beforementioned valve 31 in the handle 32 of the applicator 30. After the proper settings of valves 27 and 36 have been established they may be allowed to remain open at such settings and the unit maintained in readiness for operation requiring only the opening and adjustment of the applicator valve 31 for instant application of the fluid to a fire.

Fluids which have been found in accordance with this invention to be suitable are vegetable oils and various mixtures thereof. Vegetable oils appear to be preferable to the mineral oils and of these the drying or semi-drying types have been found to be more effective in extinguishing the metal fires particularly in magnesium.

Suitable drying and semi-drying oils are linseed, cottonseed, soy bean, croton, beechnut, corn, pumpkin seed, hemp seed and sesame seed oils, and mixtures thereof. Non-drying oils which have been found to be effective, particularly in admixture with certain of the drying types of oils are castor, palm, peanut, and olive oils.

Cottonseed, linseed and castor oils and mixtures thereof have been found to be particularly effective as employed in this invention especially when containing admixed nitrogen or preferably carbon dioxide gas in an intimate and finely dispersed form through the oils. As a specific example of the operation of this invention approximately eight (8) gallons of a mixture of two volumes of cottonseed oil having a viscosity of 57 seconds Saybolt Universal at 212° F. and 186 seconds Saybolt Universal at 100° F. and a flash point of 620° F. to one volume of castor oil, having a viscosity of 1485 seconds Saybolt Universal at 100° F. and a flash point of 505° F. was placed in the tank 10 of the fire extinguishing apparatus. Carbon dioxide was admitted to the tank 10 from the cylinder 15 to maintain a gas pressure of approximately 200 lbs. per square inch as indicated by the gauge 25. Valve 31 was then partially opened and valves 27 and 36 adjusted so that the oil-gas spray mixture issuing from the nozzle 33 was of a creamy consistency. This spray of the creamy oil-gas mixture was applied both to the top and base of an intensely burning accumulation of magnesium shavings and finely divided cuttings. The mixture immediately penetrated the quantity of burning metal around its base and through the top and promptly smothered the flames and cooled the remaining metal and its products of combustion. The action of this extinguishing fluid mixture appears to be a combination of blanketing, cooling and a chemical action which is not as yet understood. However, the presence of a drying type of oil in the mixture appears to have a favorable chemical action upon the burning metal in absorbing or excluding oxygen from the metal surfaces and the combustion zone and the presence of dispersed carbon dioxide gas in the oil appears to have a cooling effect and to prevent secondary

combustion of the oil upon contact with the incandescent metal and surrounding inflammable material. The castor oil component of the mixture being of high normal viscosity lends the proper body to the mixture to retain the gas and form a tenacious blanket on the fire.

As another example of the operation of this invention approximately eight (8) gallons of peanut oil having a viscosity of 210 seconds Saybolt Universal at 100° F. and a flash point of 590° F. was placed in the tank 10 of the fire extinguishing apparatus. Carbon dioxide was then admitted to the tank 10 from the cylinder 15 to maintain a gas pressure of approximately 200 pounds per square inch as indicated by the gauge 25. Valve 31 was then partially opened and valves 27 and 36 adjusted so that the peanut oil-carbon dioxide mixture issuing from the nozzle 33 was of a creamy consistency containing the gas in a highly dispersed form. The spray of this creamy oil gas mixture, issuing from the fan nozzle was applied to the body of an intensely burning accumulation of magnesium shavings and finely divided cuttings. The thus applied extinguishing fluid immediately penetrated the body of burning metal cuttings and promptly smothered the flames and cooled the remaining metal and its products of combustion. Peanut oil although classed as a non-drying oil appears to function advantageously in this connection by reason of its high flash point and apparent relative freedom from formation of smoke when applied to the burning metal.

The formation of the beforementioned creamy mixture of oil containing highly dispersed gas, instead of being accomplished alone by injection of gas directly into the stream of oil being expelled from the oil storage tank, also may be formed by first introducing the inert gas into the oil storage tank and holding it then under pressure for a sufficient time prior to use to allow a substantial quantity of it to dissolve in the oil. Upon subsequent release of pressure as by opening the valve 27 and allowing oil to flow from the tank and through the nozzle 34 to a region of reduced pressure, dissolved gas will be released from solution in a highly dispersed condition and in sufficient quantity to form the fluid mixture of creamy consistency referred to hereinbefore.

In cases where deep seated fires occur in large quantities of accumulated metal cuttings such as in salvage storage bins it is advantageous in extinguishing the blaze to thrust the nozzle into the body of metal cuttings by means of the applicator handle, so as to reach directly the point of combustion with the oil spray.

While an oil mixture ratio of two to one by volume of cottonseed oil and castor oil has been found to be ordinarily preferred the proportions of the mixture may be varied as desired to produce a fluid mixture of the desired viscosity and consistency to properly flow from the extinguisher unit and penetrate the particular type of metal cuttings to which it is to be applied. Where the unit is to be employed under extremely low temperature atmospheric conditions it may be desirable to substantially reduce the proportion of castor oil to cottonseed oil in order to adjust the fluidity of the mixture to a suitable value.

The application of the oil extinguishing fluid in the form of a forceful fan-shaped jet by means of the fan type of applicator nozzle has been found to aid in the prompt and effective extinguishing of the finely divided burning metal.

The foregoing is merely illustrative of the process and apparatus of the inventions and is not intended to be limiting. The invention includes any method, apparatus and materials which accomplish the objects of the invention within the scope of the claims.

We claim:

1. A fire extinguishing fluid for extinguishing burning cuttings of magnesium, aluminum, and the like combustible metals and alloys, comprising as a major effective constituent a mixture of vegetable drying oil and dispersed carbon dioxide gas in sufficient quantity to form a fluent foam.

2. A fire extinguishing fluid for extinguishing burning cuttings of magnesium, aluminum, and the like combustible metals and alloys, comprising as a major effective constituent a mixture of vegetable cottonseed oil and dispersed carbon dioxide gas in sufficient quantity to form a fluent foam.

3. A fire extinguishing fluid for extinguishing burning cuttings of magnesium, aluminum, and the like combustible metals and alloys, comprising as a major effective constituent a mixture of vegetable corn oil and dispersed carbon dioxide gas in sufficient quantity to form a fluent foam.

4. A fire extinguishing fluid capable of forming a penetrating foam for extinguishing burning cuttings of magnesium, aluminum, and the like combustible metals and alloys, comprising as major effective constituents a mixture of soy bean oil and dispersed carbon dioxide gas in sufficient quantity to form a fluent foam.

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