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METHOD OF EXTINGUISHING METAL FIRES

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6 Claims. (Cl. 169—1)

This invention relates to new and useful improvements in methods of extinguishing metal fires and more particularly to the use of a trialkoxyboroxine, such as trimethoxyboroxine, $B_3O_3(OCH_3)_3$, for extinguishing fires of highly inflammable metals such as sodium, lithium, potassium, magnesium and aluminum.

Three ingredients are necessary before it is possible to have a fire. These are fuel, heat, and an oxidizing agent such as air, oxygen, or oxidizing chemical compounds. A fire with active metals such as the alkali metals or magnesium or aluminum is no different than any other fire in this respect and it is necessary to remove only any one of the three ingredients to extinguish the fire. In most situations it is difficult to shut off the source of fuel to an active metal fire and it is therefore necessary to fight such fires by cutting off the source of oxygen or reducing the temperature of the fire below the ignition temperature. In ordinary fires involving wood or simple organic combustible materials the substance which is used to cut off the supply of oxygen (e. g. water) is also operable to reduce the temperature below the ignition point. In cases where it is not possible to use water as the extinguishing agent other non-combustible materials such as chlorinated hydrocarbons and carbon dioxide are used to blanket a combustion area and cut off the supply of oxygen to the fire. In the case of fires involving highly reactive metals none of these extinguishing agents can be used. Water, chlorinated hydrocarbons, and carbon dioxide all react readily with active metals at their flame temperatures to produce inflammable or poisonous by-products which are gaseous and will function to spread the fire over a much wider area. It has therefore been necessary in the past when attempting to extinguish fires in active metals to use a solid blanketing material such as anhydrous powdered talc or sodium carbonate or sand. Each of these solid extinguishing materials however must be completely dry to prevent the occurrence of a violent reaction with the metal and also required the use of equipment which can spread a dry powdered or granular material over the area of the fire in sufficient concentration to blanket the burning material and cut off the supply of air to that material. There has therefore existed for some time a great demand for a liquid fire extinguishing medium for active metal fires which can be easily and safely applied and which will act rapidly to extinguish such fires.

It is therefore one object of this invention to provide a new and improved method for extinguishing fires in highly reactive metals which uses a liquid extinguishing medium.

Another object of this invention is to provide a new and improved method for extinguishing fires in highly reactive metals in which the fire is supplied with a liquid or vaporized or atomized trialkoxyboroxine, such as trimethoxyboroxine.

Another object of this invention is to provide a new and improved method of extinguishing fires in highly reactive metals in which a liquid trialkoxyboroxine, such as trimethoxyboroxine, is sprayed over the combustion

area in sufficient quantity to provide enough boric oxide to coat the inflammable metal and extinguish the fire.

Other objects of this invention will become apparent from time to time throughout the specification and claims as hereinafter related.

This invention comprises a new and improved process for extinguishing fires in highly reactive metals which will be described more fully hereinafter and the novelty of which will be particularly pointed out and distinctly claimed.

This invention is based upon my discovery that a trialkoxyboroxine, such as trimethoxyboroxine,

$$B_3O_3(OCH_3)_3$$

when applied to a fire in an active metal will deposit large quantities of boric oxide on the metal surface and thus shut off the supply of oxygen to the fire and extinguish the fire. The most effective means of extinguishing metal fires using trimethoxyboroxine is to spray the liquid into the combustion area. In the case of liquid metals such as lithium, sodium, potassium and alloys of these metals the only practical means of applying the extinguishing liquid is to spray it into the combustion area. In the case of solid metals, such as magnesium or aluminum it is also possible to extinguish the flame by projecting a stream of liquid trimethoxyboroxine onto the surface of the burning metal.

In one experiment a quantity of sodium was melted and ignited and allowed to burn vigorously. A quantity of liquid trimethoxyboroxine was sprayed into the combustion area using a spray type fire extinguisher of the type used for spraying carbon tetrachloride. When the trimethoxyboroxine was sprayed into the combustion area there was a flash of green flame as the trimethoxyboroxine burned to produce a finely divided boric oxide smoke which deposited as a glassy coating on the surface of the sodium metal. The fire was almost instantly extinguished.

In another experiment a quantity of magnesium turnings was ignited and allowed to burn vigorously. Trimethoxyboroxine was sprayed onto this fire using the same apparatus as above described. As was described in connection with the sodium fire the trimethoxyboroxine spray burst into a green flame which immediately died out and left a glassy coating of boric oxide on the magnesium turnings which immediately extinguished the fire. Other experiments together with known data relative to the unreactivity of boric oxide toward active metals has shown that this process for extinguishing active metal fires is operative for all of the alkali metals, as well as for magnesium and aluminum. This process is also operative where the extinguishing liquid is trimethoxyboroxine containing either additional quantities of dissolved boric oxide or diluted with trimethyl borate. The process is also operative where the extinguishing liquid is any other trialkoxyboroxine which is liquid at room temperature, such as triethoxyboroxine, $B_3O_3(OC_2H_5)_3$, or tripropoxyboroxine, $B_3O_3(OC_3H_7)_3$.

Although there has been described herein only one embodiment of this invention it will be obvious to those skilled in the art that within the scope of the claims appended hereto this invention may be practiced otherwise than as specifically described.

Having thus described my invention what I desire to claim and secure by Letters Patent of the United States is:

1. A method of extinguishing active metal fires which comprises projecting a trialkoxyboroxine onto the fire.

2. A method according to claim 1 in which the trialkoxyboroxine is trimethoxyboroxine, $B_3O_3(OCH_3)_3$.

3. A method according to claim 2 in which the quantity of trimethoxyboroxine projected onto the fire is sufficient to generate sufficient boric oxide to substantially coat the surface of the burning metal.

4. A method according to claim 3 in which the active metal is of the group consisting of alkali metals, magnesium, and aluminum.

5. A method according to claim 4 in which the trimethoxyboroxine is sprayed onto the fire.

6. A method according to claim 4 in which the metal is a solid and the trimethoxyboroxine is projected as a stream.

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