PUBLISHED
JUNE 15, 1943.
BY A. P. C.

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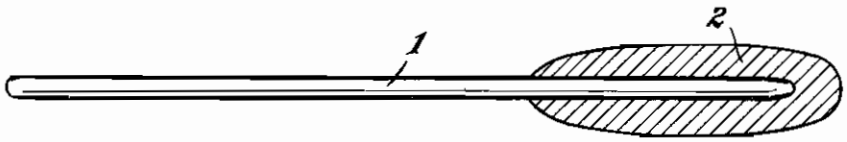
HEATING PROCESS
Filed July 7, 1937

Serial No.
152,413



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Published June 15, 1943

Serial No. 152,413

ALIEN PROPERTY CUSTODIAN

HEATING PROCESS

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vested in the Alien Property Custodian

Application filed July 7, 1937

It is known to make safety igniting materials from so-called semi-pyrophoric metals, oxygen carriers, for example potassium chlorate, and friction-producing and binding agents. The semi-pyrophoric metals act as the initial igniting substances in these materials. This use of the semi-pyrophoric metals pre-supposes that such safety igniting materials are shaped into the form of bodies which can be rubbed on a friction surface without being destroyed by the rubbing, that is to say in addition to being coherent they must have a certain minimum hardness and, when rubbed on a specially prepared friction surface, the metal together with the oxygen carrier contained in the safety igniting material must be raised to a temperature which is equal to the ignition temperature of the semi-pyrophoric metal employed. The safety igniting material which has been ignited in this manner is then employed for setting fire to other bodies which form the actual combustible material, such as for example match sticks of wood or paper or the tobacco of cigars, cigarettes and cheroots.

As distinguished therefrom, it has now been found that semi-pyrophoric metals can be used not only as the initial igniting substance in the manner described, but they can also be used with particular advantage for the production of heat as well as in some cases for transmitting the heat-producing reaction and for causing definite reactions to take place, that is to say they can be used as the combustible materials themselves. The use of these materials in this manner differs fundamentally from their use as the initial igniting substances for safety igniting materials not only in that the semi-pyrophoric metals are themselves used in accordance with the present invention as the combustible materials but also in that the combustion process can be initiated by any suitable means, for example by ignition by means of matches, candles, Bunsen burners, quick matches or by fitting a separate ignition head which is ignited by friction. The semi-pyrophoric metals, which are thus employed alone and used as the combustible material or can be employed in conjunction with other combustible materials, can be employed in practice in any suitable form or in a state of division for example in the form of a powder, which may be loose, or as a superficial coating on carrier materials or on bodies to be heated, or they can be filled into hollow bodies, that is to say the mass containing the semi-pyrophoric metals need not be present in a form in which they can be heated by friction which was necessary when the metals were used as the aforesaid safety igniting materials.

As compared with the hitherto known methods of producing heat with the aid of oxidation processes, the process in which semi-pyrophoric metals are used in accordance with the invention has the particular advantage that practically no gases of combustion are produced by the combustible material because the semi-pyrophoric metals are converted by combustion into solid oxidation products, and the addition of oxygen carriers is not necessary as it is in the case of the above-mentioned safety ignition materials. Therefore any formation of gas which may occur owing to the presence of an oxygen carrier and which might be troublesome owing to the volume of the gas evolved or to its poisonous nature or its smell or its taste is entirely avoided.

The use of semi-pyrophoric metals as a combustible material has the further great advantage that the process of heat production can be carried out extremely slowly as a glowing or smouldering process and can be prolonged over a definite period. The speed of the glowing or smouldering process can be varied by using semi-pyrophoric metals of different reactivity. In the case of other kinds of incandescing masses it is already known to retard the speed of the smouldering process by additions which retard the reaction, for example zinc oxide, iron oxide, etc. The use of semi-pyrophoric materials has the advantage that such incandescing bodies can be omitted, so that the volume of the entire combustible mass is therefore reduced. If necessary such incandescing substances or ordinary metals, for example aluminium, magnesium and zinc which also have a regulating effect on the speed of combustion, can be added. The regulation can, however, be effected more simply by using the semi-pyrophoric metals alone, in which case owing to the omission of substances which retard combustion the volume of the combustible mass is correspondingly reduced.

The present process for the production of heat can find application in the most varied fields.

One important application is, for example, the production of heat for the purpose of evolving useful gases vapours, mists, and the like by the vapourisation or thermal decomposition of substances which evolve gases and the like. In this case the semi-pyrophoric metals with or without any of the above-mentioned additions are burned together with substances, such as for example musk, resins, zinc chloride, balsams, iodine, iodine compounds and the like, which are able at

an elevated temperature to develop useful gases, vapours, mists, and the like.

For therapeutic, disinfecting vermin exterminating, odour climinating and like purposes, it is unknown to develop smoke, gases, vapours, mists, fumes and the like by making mixtures or bodies composed of substances which develop the desired gases and the like and of combustible substances and other additions and then allowing these bodies or compositions to burn. Such bodies or compositions which develop gases and the like have in general the following composition:

1. Substances which develop gases, vapours, smoke, fumes, or the like, for example perfumes, colouring materials, organic and inorganic salts, oils, tar fractions, resins, balsams, musk, ground coffee and so forth.

2. Substances which develop heat, for example, coal, sandal-wood powder, methaldehyde, paraffin and so forth.

3. Oxygen carriers, for example chlorates, nitrates, peroxides, permanganates and so forth.

4. Binding agents, for example nitrocellulose, dextrine, starch, gum tragacanth and so forth.

5. Catalysts, for example manganates, dioxide and so forth.

6. Adsorption agents, for example adsorption charcoal, kieselguhr, silica gel.

According to the present invention, the heat-developing substances mentioned under 2 above are replaced by semi-pyrophoric metals, one of these metals or a mixture of several of them or a mixture of one or more with other heat-developing substances being employed.

It is also known to develop gases and the like from masses or compositions in which certain reacting constituents are assembled together and, owing to the reaction of these constituents, the gas or vapour or the like is produced and at the same time the heat of the exothermic reaction is used for continuously supplying the heat for the vapourisation process. The easily combustible semi-pyrophoric metals can be used, in accordance also with the invention, in conjunction with such reacting constituents which develop the gas or the like. This is of particular advantage if the chemical reaction by which the gas is produced is only slightly exothermic or is endothermic and the vapourisation must be assisted by the heat of combustion of the metal.

The use of semi-pyrophoric metals in accordance with the invention offers further advantages depending on the applications to which they are put. The incandescing or smouldering process takes place without the production of flame. Therefore no production of light, which is often undesirable, occurs. The absence of a flame is also of particular advantage in those cases in which, medicinal or fumigating candles which are made in accordance with the invention and placed near the respiratory passages, which would not be possible if much flame were produced.

For perfumery purposes it is particularly important that no combustion gases should be formed by the agent which develops the heat, in order that the scents to be evolved can be obtained in a pure form, without being contaminated by a smell of burning or by noxious odours or by poisonous by-products. These are often produced by the heat-producing substances previously employed, such as for example methaldehyde and coal in which case carbon monoxide may sometimes be formed.

Owing to the absence of combustion gases which would rapidly conduct away the heat produced, higher temperatures can be obtained owing to the greater concentration of heat even in those cases where the heat capacity of the metals employed is smaller than that of the substances previously employed for developing the heat.

The gases, fumes, vapours and the like can be produced by a simple physical vapourisation of substance which are contained in the mass in solid or liquid form or by the thermal decomposition of compounds containing the constituents of the gas, or as above described by the production of a tertiary substance by means of a reaction between the constituents contained in the mass.

In so far as the substances which develop the gas or the like are themselves of an easily volatile nature they can be taken up by adsorption agents, such as adsorption charcoal. Obviously several different substances which produce gas or the like can also be employed simultaneously.

Catalysts can also be added both for assisting the ordinary combustion process, for example manganese dioxide, or also for accelerating the reaction by which the gas or the like is developed.

The masses used for carrying out the process may consist of loose powdery mixtures in which case a binding agent is not necessary. They can then be ignited on a refractory support or they can be shaped or pressed with or without a binding agent to form solid bodies, or they can be applied to carrier materials, such as for example wood, clay, porcelain, glass, magnesium, metal bodies and the like, or they can be filled into carriers made of such materials. In some cases these bodies may also be provided with means for producing the initial ignition, such as an igniting head, or a pull igniting device or the like.

One special field of application in which the heat producing process according to the present invention can be employed is in the vapourisation of iodine. For this purpose a mixture of semi-pyrophoric metal and an iodine compound or elemental iodine, which may if necessary be adsorbed in an adsorption agent such as adsorption charcoal, is combined by means of a binding agent and is applied to a suitable carrier material such as a glass or clay rod. When the mass on the carrier is ignited and caused to smoulder, the iodine vapourises and the quantity vapourised can be exactly regulated without any subsidiary odours being produced and can be used in the simplest manner for therapeutic purposes.

Another field of application is, for example, the production of heat with the aid of suitably formed bodies, tubes, rods, spirals or the like which contain semi-pyrophoric metals in the form of a powder or in a moulded or shaped condition, and are ignited at one end and then continue to glow or smoulder. The heat produced can then be utilised in other physical and chemical reactions, or for vapourisation, heating and the like or the bodies can be used as fuses or quick matches, that is to say only for passing on the heat-developing reaction.

It is possible, in accordance also with the invention, to employ the semi-pyrophoric metals for the manufacture of hand warmers, foot warmers, heating bodies for motor-cars or fillings for pressing irons and so forth. As compared with the known heat producing materials such as, for example catalyst heaters, coal or charcoal hand warmers and the like with which there is a danger of carbon monoxide poisoning, the heaters of the present invention have the advantage of being entirely free from danger.

A further field of application for semi-pyrophoric metals is in conjunction with sealing wax, sticks or cones and tubes of solder in which case the metals are preferably arranged in the interior of the cones or tubes. If the access of air to the metal is excluded then a substance which gives off oxygen, for example potassium chlorate, is added. When used in conjunction with tubes of solder a particular advantage is that no gases, which have a detrimental effect on the soldering, are formed.

In accordance also with a further feature of the invention, thermit mixtures of an aluminium, magnesium, calcium, silicon, or the like basis can be employed instead of or in addition to the semi-pyrophoric metals.

A rod or stick for developing useful gases, vapours, mists, or the like and made in accordance with the invention is illustrated by way of example in the accompanying drawing.

Referring to the drawing, the device consists of a rod, tube or similar structure 1 which is made of glass, clay, magnesia or the like, which is applied, preferably at one end, a mixture 2 which is made of one or other of the compositions which have been previously described, for example it may consist of 460 parts of semi-pyrophoric iron, 4 parts activated charcoal, 1 part iodine, and 30 parts of binding agent. The composition is applied to the carrier 1 by dipping the carrier several times into the mass while it is in a soft state.

Example 1

A mixture of 460 parts of semi-pyrophoric iron, 4 parts of activated charcoal and 1 part of iodine is stirred up with 30 parts of a binding agent to form a paste. A glass rod to which the material is to be applied is dipped into this paste and by dipping it in several times a coating of the paste is formed on the glass rod. After the binding agent has dried the mass can be ignited at one end and then smoulders slowly with the development of iodine vapour. The iodine vapour produced can be used for the treatment of catarrh.

Example 2

A small cube or cone of sealing wax of a size which is just sufficient for making a seal is filled internally to the extent of about one third of the total volume of the cube or cone of sealing wax with semi-pyrophoric iron, to which a substance which gives off oxygen, for example potassium chlorate, is added. The filling is made in such a way that, at an opening in the cavity containing the iron, the iron can be ignited by means of a match. Owing to the smouldering of the iron, the whole body of sealing wax, including its lower surface which rests on the paper or envelope to be sealed, is heated to such a temperature that the sealing wax can be pressed against it with the seal.

Example 3

A small cylindrical casing of solder of elliptical cross-section is encased with a mass composed of semi-pyrophoric iron and binding agent in such a way that the two ends of the cylinder of solder remain open. The two wires to be soldered together are introduced one beside the other into this sleeve of solder and can be provided beforehand with a small amount of soldering flux. If now the semi-pyrophoric mass is ignited the heat produced is sufficient to solder the two ends of the wires together.

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