# United States Patent [19]

**Nakayama et al.**

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[54] **HEAT RESISTANT MATERIAL**


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[51] **Int. Cl.** ..... **B05c 9/04**

[58] **Field of Search** ..... 117/68, 31, 26, 160 R; 106/15 FP



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[57] **ABSTRACT**

A heat resistant material comprising an aluminum foil or an aluminum alloy foil, having finely powdered aluminum adhering to one or both sides of said foil.


**5 Claims, No Drawings**

# HEAT RESISTANT MATERIAL

## BACKGROUND OF THE INVENTION

1. Field of the Invention

This invention relates to a heat resistant material, and more particularly to a heat resistant material which utilizes an aluminum foil or an aluminum alloy foil.

2. Description of the Prior Art

Since aluminum foils and aluminum alloy foils have superior metallic brightness, they are characterized by very high heat insulating values. The melting point of aluminum is only 660°C, however, so that when the foil is contacted with a high temperature flame, it will be melted, thus losing its heat resistance and insulating properties.

## SUMMARY OF THE INVENTION

Accordingly, it is one object of the present invention to provide a heat resistant aluminum containing material which is capable of enduring temperatures of above the melting point of aluminum.

This and other objects, as will hereinafter become more readily apparent, have been attained by the discovery that if powdered aluminum is affixed to the surface of an aluminum foil or an aluminum alloy foil, that the foil will surprisingly be capable of resisting flame temperatures of up to 850°C. without melting to an extent which would be detrimental to use as a heat resistant and insulating material.

## DETAILED DESCRIPTION OF PREFERRED EMBODIMENTS

According to one aspect of the present invention, a heat resistant material is provided which comprises an aluminum foil or an aluminum alloy foil, having a fine powder of aluminum adherently attached to one or both sides of the foil.

The aluminum foil or aluminum alloy foil used in this invention may be a foil having a thickness of 8 to 100 microns. The powder may be of any shape, and preferably having a particle size range of 5 – 200$\mu$. The fine powder may be adherently bound to the aluminum or aluminum alloy foil, by use of a binder, such as, for example, silicone resin varnish, alkyd resin varnish, spar varnish, butyl titanite resin varnish, etc. A solvent may be used, such as, for example, xyloyl, triol, fatty acid ester, etc., and/or, if necessary, a fire-proofing agent, and the mixture may be coated, or sprayed onto the surface of the foil. The thickness of the particle layer may range from 1$\mu$ up with no upper limit except for structural considerations.



It is particularly superior to fix the fine powdered aluminum onto the surfaces of both sides of the foil to obtain optimum heat resistance. Considerable heat resistance can be attained, even if only one side of the foil surface is treated with the aluminum powder. This embodiment would find utility for such applications as in printing surfaces or the like.

The thickness of the aluminum powder layer may be approximately 2 microns or less, with good results.

The details of the heat resistant mechanism of the heat resistant material of this invention is not yet clearly understood. However, it is clear that the heat resistance effect is not merely the additive effect of the powdered aluminum, but is caused by some inter-relationship between the powder and the foil.

Having now generally described the invention, a further understanding can be attained by reference to certain specific Examples which are provided herein for purposes of illustration only and are not intended to be limiting in any manner unless otherwise so specified.

| EXAMPLES | | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Temp. | Thickness of Foil (mm) Treatment | 0.008 | 0.015 | 0.02 | 0.03 | 0.04 | 0.05 | 0.06 | 0.08 | 0.1 | 0.4 |
| 850°C. | Both side non-treated | X | X | X | X | X | X | X | X | X | X |
| | Heat resisting side treated | X | X | X | O | O | O | O | O | O | O |
| | Non-heat resisting side treated | X | X | X | X | O | O | O | O | O | |
| | Both side treated | O | O | O | O | O | O | O | O | O | |
| 1000°C. | Both side non-treated | X | X | X | X | X | X | X | X | X | X |
| | Heat resisting side treated | X | X | X | X | X | X | O | O | O | O |
| | Non-heat resisting side treated | X | X | X | X | X | X | O | O | O | O |
| | Both side treated | X | O | O | O | O | O | O | O | O | O |

In this Table, "treatment" refers to coating a mixture of 12 parts finely powdered aluminum with mineral spirits in a ratio of 65 to 35, 32 parts of silicone and varnish, and 4 parts of xyloyl onto a foil having a thickness of 2 microns.

NOTE 1. The test foil was heated to 850°C. using an alcohol burner and at 1,000°C. using a gas burner for 10 minutes.

NOTE 2. "X" means that the foil was melted and a hole was created in the foil; "O" means that the material remained resistant.

As should be clear from the above Table, aluminum foils and aluminum alloy foils treated with the fine powdered aluminum onto one or both sides demonstrates significantly improved heat resistance as compared with untreated foil.

Having now fully described the invention, it will be apparent to one of ordinary skill in the art that many changes and modifications can be made thereto without departing from the spirit or scope of the invention as set forth herein. ACCORDINGLY,

What is claimed is:

1. A heat resistant material, which consists of an aluminum or aluminum alloy foil of a thickness to 0.02mm having finely powdered aluminum adherently bound to both side surfaces thereof to a thickness of no more than 2 microns.

2. The heat resistant material of claim 1, wherein said powdered aluminum is admixed with a binder.

3. The heat resistant material of claim 2, wherein said binder is selected from the group consisting of silicone resin varnish, alkyd resin varnish, spar varnish and butyl titanite resin varnish.



4. The heat resistant material of claim 1 wherein said powdered aluminum has a particle size range of 5–200 microns.

5. The heat resistant material of claim 3 which contains twelve parts finely powdered aluminum, 32 parts of silicone and varnish and 4 parts of xyloyl.

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