(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property Organization
International Bureau

(43) International Publication Date
15 January 2009 (15.01.2009)

PCT

(10) International Publication Number
WO 2009/007971 A2

(51) International Patent Classification:
*E04B 1/94* (2006.01)

(21) International Application Number:
PCT/IL2008/000951

(22) International Filing Date: 10 July 2008 (10.07.2008)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
60/949,247 12 July 2007 (12.07.2007) US

(71) Applicant and
(72) Inventor: **BARZILAI, Zvi** [IL/IL]; Moshav Haniel, 42865 Moshav Haniel (IL).

(74) Agent: **TSIVION, Yoram**; P. O. Box 3148, 38900 Caesarea (IL).

(81) Designated States *(unless otherwise indicated, for every kind of national protection available)*: AE, AG, AL, AM, AO, AT, AU, AZ, BA, BB, BG, BH, BR, BW, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IS, JP, KE, KG, KM, KN, KP, KR, KZ, LA, LC, LK, LR, LS, LT, LU, LY, MA, MD, ME, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PG, PH, PL, PT, RO, RS, RU, SC, SD, SE, SG, SK, SL, SM, ST, SV, SY, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.

(84) Designated States *(unless otherwise indicated, for every kind of regional protection available)*: ARIPO (BW, GH, GM, KE, LS, MW, MZ, NA, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU, LV, MC, MT, NL, NO, PL, PT, RO, SE, SI, SK, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

**Published:**
— *without international search report and to be republished upon receipt of that report*

(54) **Title:** FLAME- RETARDANTS FOR BUILDING ELEMENTS

(57) **Abstract:** A laminate board for building element to be used in the construction of buildings includes a core layer made of moisture-impermeable polymers, and one or more external layer, facing and attached to the core layer wherein the external layer includes a fibre net and a mixture of construction materials and flame-retarding materials.

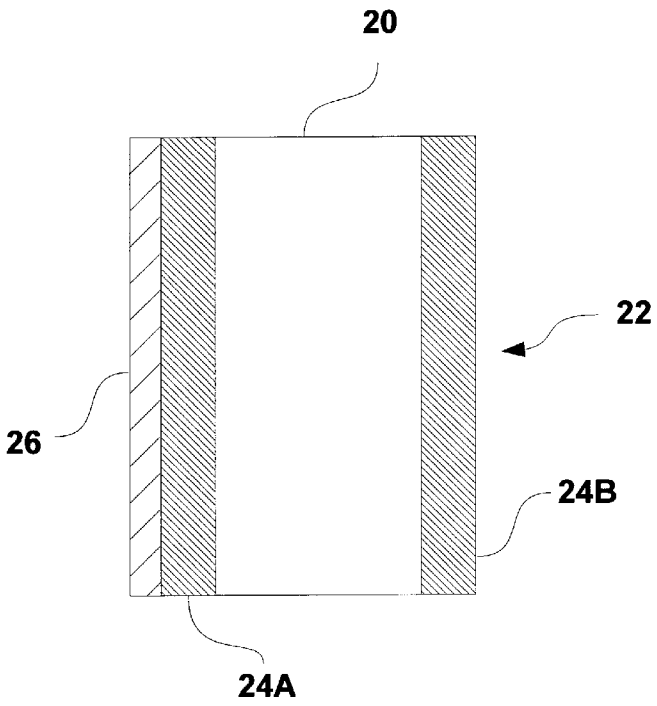


Fig. 3

WO 2009/007971 A2

# FLAME- RETARDANTS FOR BUILDING ELEMENTS

## FIELD OF THE INVENTION

The present invention relates to flame-retardants in industrial building elements in general and more particularly, to coating compositions of polymers and mineral fillers for applying to building elements which exhibit flame retardation.

## BACKGROUND OF THE INVENTION

Flame-retardants are materials that inhibit or resist the spread of fire. One way to stop spreading of the flame over a material is to create a thermal insulation barrier between the burning and unburned portions. Intumescent additives are often employed; their role is to turn the polymer into thermally insulating foam at exposure to fire. They separate the flame from the un-burnt material and slow the heat transfer typically by forming a strong and stable char which prevents further flame propagation.

Flame-retardants have been employed in the construction industry to enhance the safety of buildings. Several different types of flame-retarding

treatments are known in the art. For example, one type of treatment involves coating the surface of the building element with a flame-retarding coating, and another type involves affixing of flame-retardant containing laminates to surfaces of building elements. As an additional benefit, such treatments may reduce the amount of smoke produced in a fire, and thus potentially lower the risk of smoke inhalation by persons in a burning structure.

One example of an implementation of a flame-retardant for electrical components and building wires is disclosed in the European patent, EP00158422B1. It deals with an elastomeric thermoplastic retardant, which is a composition of polymeric components and mineral fillers such as: aluminium oxides and hydrates. The mineral fillers release water upon heating for improved flame retardation effectiveness. It is also known that mineral fillers can be treated with a coupling agent for improving the association with the filler(s) and polymeric component(s).

Halognated flame-retardant are commonly employed as components in electronic and building elements as means of reducing the flammability of such elements. However, environmental issues associated with halogenated flame-retardants have caused concern in recent years. One particular aspect is the formation of toxic micro-pollutants in combustion processes. For example, the halogenated organic compounds, polybrominated dioxins and dibenzofurans, are formed during the pyrolysis of brominated flame-retardants. These heterocyclic organic compounds are very toxic chemicals with properties and chemical structures similar to dioxins.

## BRIEF DESCRIPTION OF THE DRAWINGS

The present invention will be understood and appreciated more fully from the following detailed description taken in conjunction with the appended drawings in which:

Fig. 1 is a cross sectional view of a board of the invention, having a laminate structure in which a central core layer is flanked by two respective external layers.

Fig. 2 is a top side view of a board, showing one of the external layers with reinforcing net and a central layer,

Fig 3 is a cross sectional view of a board of the invention with an additional layer of coated plaster.

## DETAILED DESCRIPTION OF THE PRESENT INVENTION

The present invention relates to building elements such as boards and coating plaster for providing flame-retardation properties in buildings incorporating industrial building elements. A typical element embodying the invention is a multi-layered (laminate) board, having a central layer typically faced on two sides by a respective attached cover layer or a plurality thereof. The structure of such typical element is explained further with reference to **Fig. 1**, central layer **20** of the board **22** in a cross sectional view, is shown faced by two respective layers **24**. The two external layers are both structural and protective, in that they a. provide strength to the construction, and b. protect the vulnerable central layer from bending or cracking. The central layer is made of moisture-impermeable polymers, typically extruded polystyrene foam (XPS). As can be seen in **Fig. 2**, to which reference is now made, the outer layers are reinforced using a net **26** made of fibres. Typically, glass fibre is used, but other organic or inorganic polymers may be used as well. Net **26** is coated by a mixture of materials, which include construction and flame-retardant elements, such as: cement, quartz, chalk, metal hydroxides and hydrated metal oxides, typically magnesium hydroxide and aluminiuma. In

another aspect of the invention, the external layers can also function as a primer for additional coating such as plaster, used typically as coating for a wall. As can be seen in **Fig. 3**, plaster layer **26** is laid on one of the external layers of the board, namely layer **24A**, to provide a wall covering. This additional layer may have flame retardation traits on its own merit in addition to the flame retardation of subtending layer **24A**.

## ADVANTAGES OF THE INVENTION

The advantages of the invention have been proven in several safety examinations and tests. For example, tests were conducted in compliance with Underwriters laboratories (UL). In the test, a specimen of the coated boards has been exposed to flame under controlled laboratory conditions. The boards has attained the UL's flame spread class UL 94 V-0 that represents a high resistance to ignition, owing to the fact that none of the test samples burn or emit burning particles. Tests conducted in compliance with the British standard, examined the board flammability as well. As judged by the British standard 476/7, the grade for the boards attained Class 1 definition, the highest level.

## CLAIMS

1. A laminate board for building element to be used in the construction of buildings, comprising:
    - a core layer made of moisture-impermeable polymers, and
    - at least one external layer, facing and attached to said core layer wherein said at least one external layer includes at least a fibre net and a mixture of construction materials and flame-retarding materials.

2. The board as in claim 1, comprising two external layers, and a core layer disposed in between.

3. The board as in claim 1, wherein said moisture-impermeable polymer is extruded polystyrene foam (XPS).

4. The board as in claim 1, wherein said fibres of said net are made of a material selected from the group of materials consisting of: fibreglass, organic polymers, inorganic polymers and a combination thereof.

5. The board as in claim 1, wherein said inorganic polymer is glass.

6. The board as in claim 1, wherein said construction materials of said external layers are selected from the group consisting of: plastic additives, quartz, chalk, cement and any combination thereof.

7. A board as in claim 1, wherein said flame-retardant materials of said external layers are selected from the group consisting of: alumina hydroxide, magnesium hydroxide, other metal hydroxides and hydrated metal oxides, and any combination thereof.

8. The board as in claim 1, wherein said hydrated metal oxide is Alumina tri-hydrate.

9. A plaster layer containing the same flame retarding materials as in claim 7, for coating of walls in buildings for conveying flame retarding properties to said walls.

10. A plaster layer as in claim 9, comprising the same group of materials as in claim 6 and 7.

11. A method of manufacturing a board having flame retarding properties, for use in buildings construction, said method comprising the steps of:

- laying a fibre net over one side of a moisture-impermeable core layer;
- coating an external layer over said one side of said core layer;
- repeating said laying of net and said coating on a second side of said core layer, and
- subjecting said layers to pressure and heat to form said board.

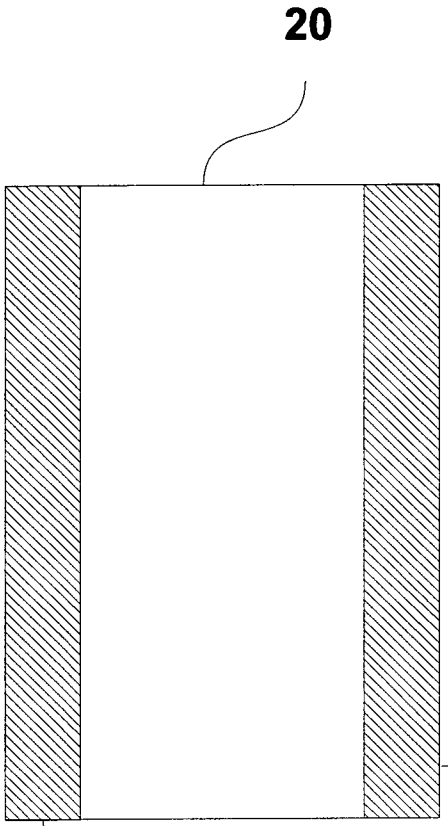


Fig. 1

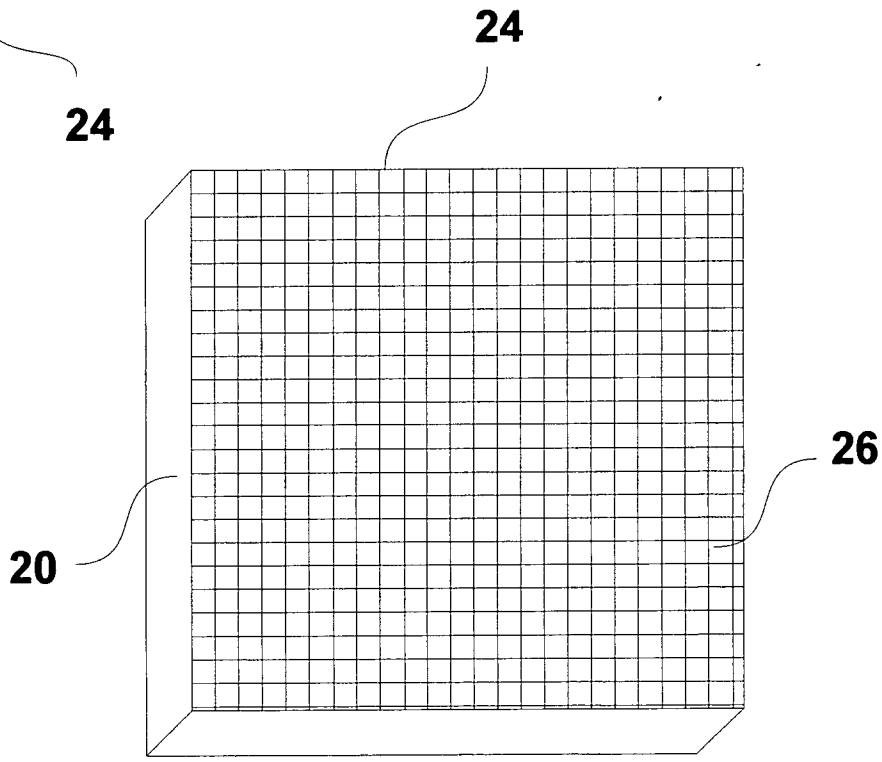


Fig. 2

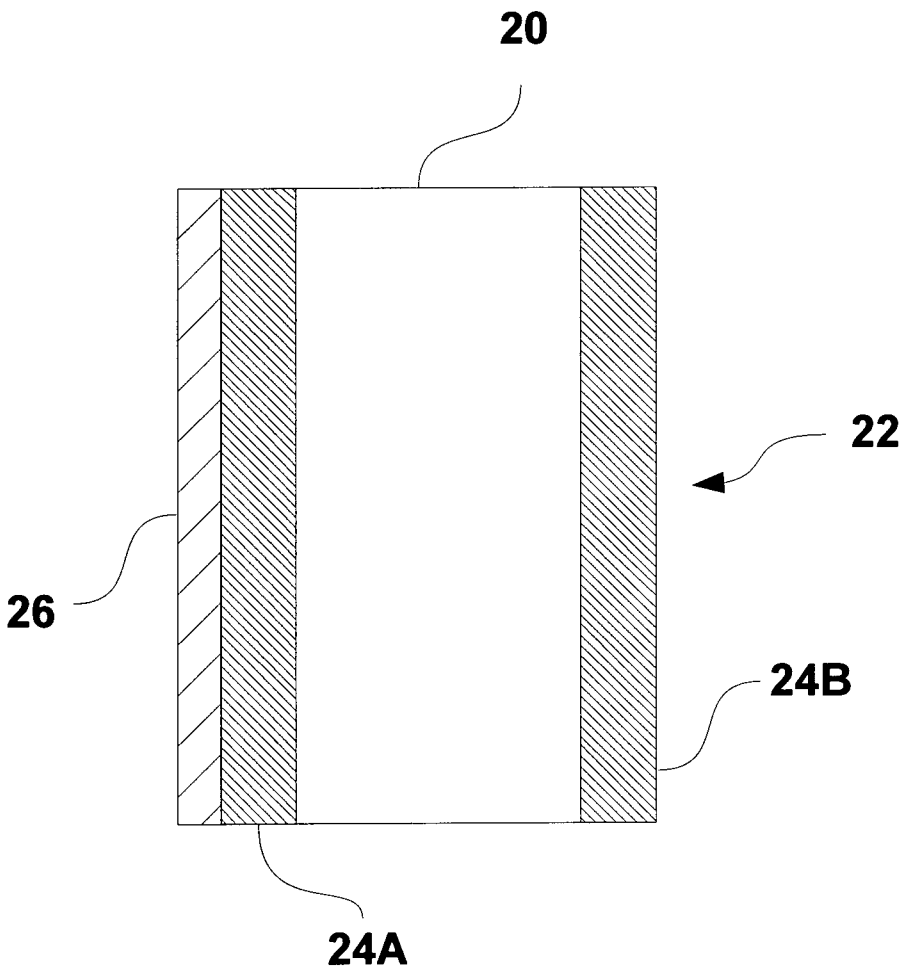


Fig. 3