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Window Covering

The invention relates to a window covering, such as a roller blind, Venetian blind or the like, of a material in the form of a web which is made from a coated supporting layer consisting of fibres, foils or the like and only having a mechanical not a thermally insulating function, wherein an IR-reflecting reflex layer of metal is disposed on at least one side of the supporting layer and over that an IR-transmitting protective layer of a plastics material, for example polyethylene or the like, and the protective layer(s) is or are made so thin that their thermal absorption is as low as possible.

Such a window covering is described in the GB-A-915 518. The window covering has a supporting layer on which an aluminium layer is vapour-deposited. Applied to this layer is a thin protective layer, for example of polyethylene, which is substantially transmissive to thermal IR-radiation. It is made so thin that its thermal absorption is as low as possible. As a result of this construction, the IR-radiation is reflected on the particular aluminium layer and thrown back again. In this manner, the window covering represents a highly effective insulation both against the outflow of heat in the cold season, particularly at night, and against unwanted heating of the room in the warm season, particularly with solar irradiation. In addition, the formation of a cold screen is prevented in the cold season.

Thus the largest thermal "hole" in a room can be blocked by a window covering equipped in such a manner, which is of great importance, bearing in mind increasing energy costs.

The window covering described above has the disadvantage, however, that the metal layers are clearly visible because of the protective layers of transparent construction. The reflecting glare caused by this is unsatisfactory aesthetically, however, and is very disturbing when rays of light fall on it because the reflecting rays can dazzle.

In the CH-A-516 053, a heat-insulating material which can be used, in particular, for covering walls and ceilings is described which comprises a heat-insulating support of rigid foam plastics or compressed foam plastics, to which a supporting foil is bonded. An IR-reflecting layer of metal is in turn vapour-deposited on this and is protected by a wear-resistant coating which transmits thermal radiation and which is intended to keep mechanical and chemical influences away from the metal layer. The coating may also be so constructed that there is only selective reflection at the metal layer, in that an appropriate colouring is carried out. It is a prerequisite for this that the layer thickness of the coating must then only be a quarter of the wavelength to be reflected.

The heat-reflecting material described above is intended for purposes where a thermal insulation and a reflection of thermal radiation are required at the same time because the material has an insulating support. "indow

coverings of the type mentioned at the beginning were obviously not considered because an insulating support would be useless in this field. Apart from this, it is true that there is a reference to the possibility of achieving a selective reflection or absorption by appropriate colouring. In order to obtain such an effect, however, a thickness of layer is prescribed which practically cannot be produced with the uniformity then necessary. In addition, with a layer thickness which is a quarter of the wavelength of the electromagnetic waves to be reflected, selectivity can be achieved, at most, within a very narrow range of wavelengths which only covers a small proportion of the range of wavelengths of thermal IR-radiation.

It is the object of the invention to provide a window covering of the type mentioned at the beginning, the optical appearance of which can be designed freely within a wide range, while concealing the reflex layer, but at the same time the thermal absorption of the particular protective layer should remain low in the whole range of wavelengths of the thermal IR radiation, that is to say the thermal effect of the reflex layer is not substantially impaired.

According to the invention, this problem is solved in that the protective layer contains colouring, particularly colour pigments in a size distribution which is relatively great in relation to the wavelength of the radiation in the visual range and relatively small in relation to the wavelength of the radiation in the IR range, in such a concentration

that the particular reflex layer is no longer visible and a coloured impression results visually, but its reflex function in the thermal IR range is largely retained.

It has been found that protective layers which meet these conditions can be freely designed from the colour point of view, while on the one hand the reflex layer is visually concealed but on the other hand the absorption in the protective layer is only very slight in the whole range of wavelengths of the thermal IR radiation. This freedom of design afforded from the colour point of view ensures that the window covering according to the invention has the necessary marketability because this is determined in the first instance by the appearance of the window covering. At the same time, it is a great advantage that, despite these design possibilities, the reflection effect of the reflex layer is substantially retained. In this manner, a window covering is provided which has an excellent insulating effect for thermal radiation but this function is not seen.

In a development of the invention, it is provided that both sides of the supporting layer are provided with a reflex layer and a protective layer applied to this. This form of embodiment is particularly advantageous because then an unwanted heating of the room is avoided in the warm season, particularly by solar irradiation. In addition, the formation of a cold screen is prevented in the cold season.

In a further development of the invention, it is provided that the front and possibly the back is or are adapted in their reflection capacity to the range of wavelengths of the particular thermactinic radiation prevailing.

Furthermore, it is possible, within the meaning of the invention, to hollow out the reflex layer partially, particularly in the form of a pattern, if necessary in register on both sides, in order to allow a comparatively small proportion of the daylight through the window covering into the interior and to enable the inhabitant of the room to find his way about without using the room lighting installation.

The invention is explained in more detail below with reference to an example of embodiment illustrated in the single drawing.

The supporting material in the form of a web, illustrated in the drawing and consisting of fibres or the like coated for the production of insulating roller blinds or the like, is constructed as follows:

The material consists essentially of three different types of layers. A layer 2, which is highly reflecting in the thermal IR range (from 5 to 25 μm wavelength) is applied symmetrically to both sides of a supporting layer 1 of textile or paper which is smooth on both sides. The selection of the support is not important for the present invention. The support 1 has only a mechanical and not a thermal-insulating function.

A layer of colour 3, in one or more colours, is applied over the full area or part of the area of the reflecting layer 2, again functionally symmetrically at both sides. This layer is so constructed that the functionally symmetrical reflection of the layer 2 in the thermal IR range is not counteracted but has any desired absorption in the range from 400 to 900 nm wavelength in order to achieve a coloured impression visually.

This effect is achieved by appropriate selection of carrying bases or binders and the geometrical dimensioning of the layer thickness and pigment size. Known infra-red-transmissive plastics materials may be used as binder material such as specially formulated polyethylene or isomerized rubber (cyclized rubber). The size of the pigments incorporated in the layer of binding agent and the thickness of the layer of binding agent, that is to say the maximum number of layers and pigments one above the other in this layer, is selected so that in accordance with the law of Mie scattering, for radiation in the optical range, a diffuse scattering results with corresponding absorption bands according to the colouring determined by the pigments and, in the IR radiation range, a directional scattering for the IR radiation results. This means that pigments are selected having a size distribution, the size of which is relatively greater than the wavelength of the radiation in the optical range and relatively small in relation to the wavelength of the radiation in the IR range. Furthermore,

the layer thickness is selected as thin as possible so that, if possible, there are only two layers of pigment in the layer.

From the point of view of colour, it is not necessary to aim at symmetry of the two sides. The visual colouring is no criterion for the function of the material in the form of a web for the production of insulating roller blinds or the like, but the invention opens up yet another degree of freedom for artistic design without restricting the fundamental function.

For the colouring, the effect is used that materials reflect, absorb or transmit differently at different wavelengths of the spectrum. The invention is a screening in the thermal IR range, preferably acting symmetrically, without the metallic glossy surfaces which are otherwise restrictive, have a monotonous effect and are unsatisfactory aesthetically.

According to the invention, in one development of the material, allowance is made for the fact that the spectral distribution of an energy radiator depends greatly on its temperature, in that the front and possibly the back, is made optimum for the particular relevant spectral range.



Patent Claims

1. A window covering, such as a roller blind, Venetian blind or the like, of a material in the form of a web which is made from a coated supporting layer (1) consisting of fibres, foils or the like and only having a mechanical not a thermally insulating function, wherein an IR-reflecting reflex layer (2) of metal is disposed on at least one of the sides of the supporting layer (1) and over that an IR-transmitting protective layer (3) of a plastics material, for example polyethylene or the like, and the protective layer(s) (3) contains colouring, particularly colour pigments, in a size distribution which is relatively great in relation to the wavelength of the radiation in the visual range and relatively small in relation to the wavelength of the radiation in the IR range, in such a concentration that the particular reflex layer (2) is no longer visible and a coloured impression results visually, but its reflex function in the thermal IR range is largely retained.

2. A window covering as claimed in Claim 1, characterised in that both sides of the supporting layer (1) are provided with a reflex layer (2) and a protective layer (3) applied thereto.

3. A window covering as claimed in Claim 1 or 2, characterised in that the front and possibly the back is adapted in its reflection capacity to the wavelength



range of the particular thermatinic radiation prevailing.

4. A window covering as claimed in one of the Claims 1 to 3, characterised in that the reflex layer (2) is partially hollowed out, particularly in the form of a pattern, if necessary being in register on both sides.

French Claims

1. A window-closing device such as a blind, Venetian blind or other similar device, of a material in the form of a web made from a coated supporting layer (1) of fibres, sheets or other similar elements, having a purely mechanical function but not an insulating function from the thermal point of view, a reflecting layer of metal (2) reflecting infrared radiation being disposed on at least one of the faces of the supporting layer (1) and a protective layer (3) of plastics material, for example of polyethylene or other similar material transparent to infrared radiation, being disposed above the reflecting layer, and the protective layer or layers (3) is or are so thin that their thermal absorption is as small as possible, characterised in that the protective layer or layers (3) contain colorants, particularly coloured pigments, of which the distribution of the dimensions is relatively great in relation to the wavelengths of the radiation in the visible range and relatively small in relation to the wavelengths of the radiation in the infrared range, in such an amount that the reflecting layer

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(2) is no longer visible and that a coloured impression is produced visually but that its reflecting function in the thermal infrared range is retained to a large extent.

2. A window-closing device as claimed in Claim 1, characterised in that both faces of the supporting layer (1) are provided with a reflecting layer (2) and with a protective layer (3) deposited on this.

3. A window-closing device as claimed in Claim 1 or 2, characterised in that the reflecting power of the front face and, where appropriate, of the rear face, is adapted to the wavelength range of the prevailing thermal radiation.

4. A window-closing device as claimed in one of the Claims 1 to 3, characterised in that the reflecting layer (2) is, if necessary, partially hollowed out, particularly in the form of a pattern, in a manner in coincidence on both faces.