

Heat-reflecting wall-paper or wall covering

The invention relates to a heat-reflecting wall-paper or wall covering having a supporting material of paper or plastics which may be provided with adhesive and which has a thin metal layer vapour-deposited on one or both sides and is covered with a coating which appears transparent in the infrared spectral range but coloured in the visible spectral range. Such wall coverings are used in building construction or in the heating art.

A wall-papering strip is known from the German Utility Model 73 43 047 wherein an aluminium layer is applied to a layer of rigid foam. In order to embellish the outside of the aluminium layer, this may be embossed with a pattern and at the same time, the outside of the aluminium layer may be provided with a protective varnishing in order to repel dirt adequately.

A metallized wall-paper is described in the German Patent Specification 677 123 wherein the metallic upper layer as well as the intermediate layer of paper connected thereto are perforated in register to improve the permeability to moisture, while the two perforated composite layers were attached to a further unperforated lower layer of paper.

A metallized wall-paper of the type mentioned above is known from the German Patent Specification 800 857 and was additionally coated with a very thin layer of varnish which may also be coloured in any desired tints.

The known wall-papers suffer from the common disadvantage, however, that they do not render possible any optimum reflection of the room heat if they are provided with colours. If no colour is applied to the metallic layer, however, then it is found that these metallic surfaces, which have a shiny effect, are not accepted for the wall-papering of normal living rooms for aesthetic reasons.

A heat-insulating material which can be used for lining walls is known from the DE-A-19 55 953 or the CH-A-516 053 wherein a thin metal layer having a thickness of between 3 and 30 nm is vapour-deposited on a supporting material. The metal layer is coated with a thin coating having a thickness of between 1 and 5 μm . It is true that if this coating consists of a material which is transparent in the optically visible and infrared wavelength ranges, then a satisfactory reflection of thermal radiation results but the whole wall covering has a metallic appearance which is undesirable. If the coating is coloured, however, then a selective absorption or reflection at the insulating material may be reinforced so that the insulating material appears coloured in the visible spectral range but still transmissive - even though to a restricted extent - in the infrared spectral range. This dyeing prevents an effective protection of the subjacent thin metal layer from corrosion, however, and the adhesion of the coating to the metal layer is considerably reduced. Furthermore, from the safety

point of view, there is a danger, with such an insulating material, that the continuous metal layer may come into contact with lines carrying voltage as a result of which there is a considerable risk of injury on touching the wall covering.

From the US Patent Specification 3 476 629, it is known to make a metallized fabric or a fabric covered with a metal foil porous by allowing the fabric with the metal layer to run over a calender on which the metal layer is shredded into a plurality of pieces.

A heat-reflecting, laminated multi-layer web is known from the DE-A-28 28 576 wherein a transparent synthetic layer of resin is applied to an opaque supporting material and then a layer of a semiconductor material which reflects IR rays but is transmissive in the visible range. In this known wall covering, the problem of a coloured formation of a heat-reflecting wall covering is solved in that the supporting material is made coloured in the desired manner. In this case, however, the external metal layer which reflects infrared radiation must then be transparent. This means that the external layer, which, on the one hand reflects thermal radiation but is transparent to visible light, must be made from a semiconducting material. This material is extremely expensive and, in addition, it leads to the danger that the whole wall covering may conduct voltage or current if this external layer comes into contact with a line carrying voltage.

It is therefore the object of the present invention to provide a heat-reflecting wall-paper which can be produced at comparatively low cost, has a high thermal reflection, can be made appropriately coloured and does not have any electrical conductivity. According to the invention, this is achieved by the combination of the following features:

a) the metal layer, which is thinner than 30 nm, is applied to the supporting material,

b) a protective layer, which protects the metal layer from corrosion and serves to facilitate adhesion and/or as a primer and which has a maximum thickness of a few μm (that is to say up to 10 μm), preferably a thickness of about 0.5 μm , is applied to the metal layer,

c) a varnish containing a binding agent which is IR-transmissive and/or a colour print containing such a binding agent, is applied to the protective layer as a coating with a thickness of a few 10 μm which is largely transparent in the wavelength range from 4 to 20 μm but appears coloured in the wavelength range from 0.4 to 0.8 μm , and

d) the metal layer has hairline cracks which make the surface conductivity of the metal layer practically ineffective.

It is known that, because of the high density of free electrons, metal layers reflect electromagnetic radiation even with layer thicknesses which are substantially thinner than the wavelength of the radiation. The extent of the reflection is correlated with the surface resistance of the metal layer and no longer increases appreciably beyond a surface resistance of 2 Ohms per square for $1 \mu\text{m} < \lambda < 20 \mu\text{m}$.

This corresponds to a layer thickness of 14 nm for aluminium, the vapour-deposited metal which is most frequently used. In order to cover other metals on the one hand and irregularities in the vapour-deposited layer on the other hand, the layer thickness is selected up to 30 nm. It is true that layers with greater thicknesses are likewise possible but the reflection is no longer improved with greater layer thicknesses. On the other hand, greater layer thicknesses require more material to be vapour-deposited which only increases the production costs unnecessarily.

As a result of the selection of an extremely thin metal layer with a layer thickness up to 30 nm, on the one hand assurance is provided that a maximum reflection of thermal radiation is obtained, on the other hand the whole wall-paper or whole wall covering is in no way appreciably stiffened by the metal layer but remains extremely flexible as usual in wall-papers hitherto known, so that such wall-papers can be handled easily. Thus a minimum expenditure on material as well as a wall-paper which scarcely differs from those hitherto known in its behaviour when fixing the wall-paper is obtained with maximum reflection capacity.

Moreover, with a thickness of the metal layer going beyond that given, assurance would no longer be provided, to an adequate extent, that the layer would be broken up into numerous small islands during the pressing and rolling of the wall-paper or the wall covering or in a separate stretching or deformation process of the supporting material.

This is actually necessary, because such a metal layer originally has such a high conductivity for low-frequency a.c. voltages and d.c. voltage that there is a great danger if a wall covering which is thus equipped accidentally comes into contact with the lighting circuit. In the case of the wall-paper or wall covering according to the invention, therefore, in order to prevent electrical short-circuits, the supporting foil is extended, after the application of the metal layer, by a following stretching or deformation process so that the surface conductivity of the metal layer becomes practically ineffective as a result of the hairline cracks formed in the course of this, because the metal layer is then broken up into extremely small islands by the hairline cracks. The deformation process of the supporting foil is preferably only carried out when at least the protective layer has been applied to the metal layer, because the protective layer must be applied very thinly, which is difficult after the deformation process. If a polyester layer is used as a protective layer, the dielectric strength is above 100 V/ μm . Thus a wall-paper is obtained which renders possible an optical reflection of thermal radiation, does not differ in any way from previously known wall-papers with regard to stiffness and which, in contrast to the metallized wall-papers hitherto known does not involve the risk of electrical short-circuits.

As a result of the tearing of the thin metal layer, the effect is also achieved that the wall-paper as a whole becomes permeable to water vapour. Therefore, although it has a reflection of the thermal radiation of more

than 60%, such a wall-paper does not act as a steam barrier but permits a moisture exchange with the wall behind it. As a result, a room atmosphere is created as with the wall-papers hitherto usual.

The thickness of the protective layer, which also serves to facilitate adhesion or as a primer for the varnish or the colour printing, is selected so that it becomes largely free of pores as a result of repeated varnishing or repeated colour printing, in order to prevent the corrosion of the metal layer but is still satisfactorily transparent over the whole spectral range of importance for the thermal radiation.

The thickness of the protective layer should be as small as possible and should not be selected as more than a $\lambda/4$ layer for the shortest relevant IR wavelength. A layer thickness in the region of $0.5 \mu\text{m}$ has proved particularly favourable. It should not exceed a few μm . The layer may consist of the same binding-agent materials as are used for the varnishing, for example polymethacrylate.

The main reason for fitting a wall covering is the aesthetic improvement of the wall or ceiling. Other functions, even if these lead to considerable improvements in quality or savings in energy, as in the present case, should not impair the appearance or should scarcely do so. Accordingly, the wall covering, which originally has a metallic effect, must be able to be provided with a colour which can be selected freely. Conventional wall paints are, however,

composed of binding agents which, on the one hand have strong IR absorption bands and on the other hand are applied in a layer thickness which is uncontrolled and contain pigments, the selection and size of which depends only on visual criteria. Therefore, these paints have an absorbing effect in the thermal radiation range, they are, so to speak, black and cold. In order to obtain the high heat reflection and hence the effect of a metallized wall covering which increases comfort or saves heating costs, the colour applied with the varnish or the colour printing must be largely transparent in the wavelength range from 4 to 20 μm . This is achieved by binding agents which have little or no absorption in this range and in which colouring matter is dissolved which is likewise transparent in this spectral range. Polymethylene of diazo methane, low-pressure polyethylene, high-pressure polyethylene, isomerized rubber (cyclized rubber), various sorts of polyamide, low-molecular acrylates etc. are known as examples of binding agents which are transmissive in the IR range. In a layer thickness of 10 μm , such layers have a total IR absorption of less than 10%.

For the colouring or printing of the layer of binding agent forming the varnishing or the colour printing, colouring agents should be used which are transparent in the IR spectral range, such as alizarin or azo dyes. If pigment particles are used in the layer of binding agent to form a priming coat, then, if possible, all the pigment particles should have a diameter which is smaller than 1 μm . A size distribution of pigment particles wherein the pigment

diameters have a Gauss distribution of $0.35\text{ }\mu\text{m}$ has proved suitable, for example. The ratio of binding agent to pigment components should be as high as possible and the layer thickness of the varnishing or of the colour printing should be selected as thin as possible. Preferably, such a layer thickness and such a ratio of binding agent to pigment component are selected that, on average, about two layers of pigment particles are loosely embedded in the binding agent, so that a high transparency of the varnishing or of the colour printing results in the whole relevant IR range. Any substances which do not themselves have any IR molecule resonance may be used as pigments. Such resonances appear, for example, in organic substances with radicals. Inorganic pigment substances such as TiO_2 for example, are particularly suitable.

Cooperation of the coloured pigments with the colouring by means of soluble colouring agents in the layer of binding agent in accordance with the idea previously described can lead to various colour effects in the optical range which renders possible a far-reaching freedom in the colouring design. Of the alternatives varnishing and colour printing, the latter process is preferable so that the printing methods usual in wall-paper manufacture can be further utilized. The visible side or top may be given any desired design without a metallic appearance occurring as in the former heat-reflecting wall-papers. The effectiveness of the high reflectivity in the wavelength range from 5 to $25\text{ }\mu\text{m}$ is not or not substantially impaired by this printing.

Different colour tints and patterns can be produced in one or more printing operations with a suitable selection of colour pigments and selection of coloured binder.

The present invention is further based on the idea that the heat-reflecting wall-paper or a corresponding wall covering according to the invention is only of economic use and of political economic use if such a wall-paper or such a wall covering is in fact accepted by the consumer. This can only be achieved if such a wall-paper can be hung by conventional paper-hanging methods, that is to say without special expense and without cost-intensive methods, as for example without the need for a special adhesive and so can be hung cheaply and if such a wall-paper or such a wall covering can be printed with the usual printed designs so that the consumer's wishes can be met. These requirements can be met, in particular, by a heat-reflecting wall-paper wherein the supporting material consists of a thin special paper which is covered with a thin primer coat to which the metal layer, the protective layer and the varnishing or the colour printing are applied and wherein the supporting material is applied to a wall-paper by means of a bonding adhesive. Such a wall-paper can easily be handled by conventional wall-papering methods. Furthermore, the outside of the wall-paper can be printed with conventional printed designs by conventional printing methods. Both characteristics make the wall-paper more acceptable to the consumer so that it is used economically and leads to the desired economic result by saving heating energy. As a

result of the fact that the wall-paper can be printed with conventional printed designs, a wall-paper is provided which causes the same feeling of pleasure as the wall-papers hitherto known but additionally leads to the important advantage that considerable energy is saved in heating the room.

If colour printing is used, the printing operation should be carried out on the special paper before the bonding to the ordinary wall-paper is effected.

In order to render possible handling of the wall-paper as far as possible by the means hitherto known, the ordinary wall-paper is selected in the order of magnitude of 100 to 200 g/m², the metal-coated thin special paper in the order of magnitude of 10 to 50 g/m² and the intervening layer of paper adhesive is applied in a thickness of the order of magnitude of 10 µm. This combination of layers has already been tried out successfully in practice. During the development of the wall-paper according to the invention, it was found that the bonding layer, which originally only served the purpose of sticking the ordinary wall-paper to the supporting material, is of such a nature that it additionally takes over the following functions:

1. The bonding layer, which consists of polyvinyl chloride for example and, in the finished wall-paper, connects the ordinary wall-paper to the special paper and lies in the mechanically neutral zone, is preferably made soft so that the bonding layer promotes the pliability and flexibility

of the wall-paper during the hanging. As a result of this, even an amateur can hang this wall-paper on the walls without difficulty.

2. As a result of the suitable chemical composition of the bonding layer, the combustibility and inflammability of the wall-paper is prevented.

3. As a result of the chemical composition of the bonding adhesive, the bonding layer protects the metal layer from corrosion by alkaline components emerging from the wall.

If rooms are equipped with such a wall-paper, the cold veil is avoided (see *Energiespartips* Volume 2, published by the Bay. Ministerium für Wirtschaft und Verkehr in September 1978).

Outside walls absorb the body heat of the occupants, according to their surface temperature and their emission behaviour. If this heat is reflected by the wall-paper, a radiation climate results in the room which meets the comfort conditions at a low room temperature.

This fact has considerable economic significance and makes it possible to lower the air and room temperature of heated rooms by at least 2 to 5°C without undesirable physiological effects.

According to publications which are generally accessible, the lowering of the room temperature by 3°C leads to a saving of about 18% in heating material, which is important in present times.

A particularly pleasant room climate is provided as a result of the fact that the metal layer is made so thin that it tears during the pressing and rolling of the wall-paper, as a result of which the wall-paper as a whole becomes permeable to water vapour.

The invention will be explained in more detail below with reference to preferred examples of embodiment illustrated in the drawing. In the drawing:

Figure 1 shows a sectional view through a first form of embodiment of a wall-paper constructed according to the invention.

Figure 2 shows a sectional view through a second form of embodiment of a wall-paper constructed according to the invention and

Figure 3 shows a sectional view through a third form of embodiment of a wall-paper constructed according to the invention.

In Figure 1, a wall-paper is illustrated wherein a very thin metal layer 2, which is preferably vapour-deposited, is applied to a supporting material 1 which preferably consists of a paper material. The laminated material formed from the supporting material 1 and the metal layer 2 applied thereto, is preferably processed mechanically, for example by stamping, before the further processing, in such a manner that the metal layer 2 is broken up into as many small islands as possible. Then a thin protective layer of varnish 3 is applied to the metal layer 2. Then the actual varnishing 4, in which colouring agents may be

dissolved in a binding agent or be dispersed in the form of pigments, is applied to the free side of the protective layer of varnish.

The idea on which this wall covering is based consists in that the thermal energy in a room is retained by reflection on the walls of the room and does not heat the walls. This effect can be reinforced further by the fact that the laminated wall-paper material constructed as shown in Figure 1 with the layers 1 to 4 is applied to an embossed, burled or corrugated thermally insulating web 15 which includes air spaces and carries a layer of adhesive 26 at the attachment side, as illustrated in Figure 2. In this Figure, the layers 1 to 4 shown in Figure 1 are designated by corresponding reference numerals 11 to 14.

The support 17 to which the insulating web 15 is applied may also, according to the example of embodiment in Figure 2, consist of a laminated material which consists of a supporting material 21, a metal layer 22 applied thereto and a varnishing 23, the adhesive layer 26 for applying the wall-paper or the wall covering to a wall being provided at the free side of the supporting material 21. Thus the system shown in Figure 2 practically consists of two layers of the composite material consisting of the layers 11 to 41 or 21 to 23, which are connected to one another by an embossed, burled or corrugated intermediate support 15 of paper or plastics material which includes air or gas spaces. In this case, it is obviously not necessary to provide the layers of this composite system facing inwards towards the wall with the varnish coating 14 having an optical effect. From these

points of view, apart from the thermal reflection, the thermal conductivity is also prevented so that the conduction of heat into the wall is also substantially decreased.

By means of the wall-paper described above, a wall-paper or a wall covering with a coloured coating is provided which has a reflection of IR radiation of more than 60%. The wall-papers with a coloured coating hitherto known had, at most, a reflection of the IR radiation of 5-10%.

A form of embodiment of the wall-paper according to the invention is illustrated in Figure 3 wherein a thin layer of a special paper 31 is applied to an ordinary wall-paper 37 by means of a layer of bonding adhesive 38.

The special paper is covered with a coat of primer 39 at its side remote from the layer of bonding adhesive 38. A thin metal layer 32, for example of aluminium, is vapour-deposited on the primer coat or the metal primer coat. Applied to the metal coat 32 is a thin protective layer of varnish 33 to which the varnishing 4 is then applied. As already stated, the varnishing can be formed by a single-colour or multi-colour colour printing, in which case the protective layer of varnish 33 serves as a primer for this colour printing.

An example of an embodiment for a preferred construction of wall-paper will be given below, the layer sequence a-g being given from the inside to the outside of the wall-paper:

a) Base of backing paper with a thickness of 150 g/m^2 ,

b) Layer of bonding adhesive of polyvinyl chloride with a thickness of 10 μm ,

c) Special paper of moisture-resistant paper with a weight of 50 g/m^2 and with a varnish coat of PVC copolymer applied thereto with a thickness of 1.5 μm ,

d) Aluminium layer with a thickness of 20 nm,

e) Varnish coat of PVC copolymer with a thickness of 0.5 μm ,

f) Coat of varnish with a layer of binding agent of polymethacrylate with a thickness of 20 μm . TiO_2 pigment particles were dispersed in the layer of binding agent and had a diameter of less than 1 μm . The ratio by weight of binding agent to pigment particles was 50%.

g) The coat of varnish was printed with an alizarin dye penetrating into this with a thickness of 2 μm .

Claims

1. A heat-reflecting wall-paper or wall covering with a supporting material (1, 11, 21, 31) of paper or plastics material possibly provided with adhesive, which supporting material has a thin metal layer (2, 12, 22, 32) vapour-deposited on one or both sides and is covered with a coating (4, 14, 34) which appears transparent in the infrared spectral range but coloured in the visible spectral range, characterised by the combination of the following features:

a) the metal layer (2, 12, 32), which is thinner than 30 nm, is applied to the supporting material,



b) Layer of bonding adhesive of polyvinyl chloride with a thickness of 10 μm ,

c) Special paper of moisture-resistant paper with a weight of 50 g/m^2 and with a varnish coat of PVC copolymer applied thereto with a thickness of 1.5 μm ,

d) Aluminium layer with a thickness of 20 nm,

e) Varnish coat of PVC copolymer with a thickness of 0.5 μm ,

f) Coat of varnish with a layer of binding agent of polymethacrylate with a thickness of 20 μm . TiO_2 pigment particles were dispersed in the layer of binding agent and had a diameter of less than 1 μm . The ratio by weight of binding agent to pigment particles was 50%.

g) The coat of varnish was printed with an alizarin dye penetrating into this with a thickness of 2 μm .

Claims

1. A heat-reflecting wall-paper or wall covering with a supporting material (1, 11, 21, 31) of paper or plastics material possibly provided with adhesive, which supporting material has a thin metal layer (2, 12, 22, 32) vapour-deposited on one or both sides and is covered with a coating (4, 14, 34) which appears transparent in the infrared spectral range but coloured in the visible spectral range, characterised by the combination of the following features:

a) the metal layer (2, 12, 32), which is thinner than 30 nm, is applied to the supporting material,



b) a protective layer (3, 13, 33) which serves to protect the metal layer from corrosion and as a means to facilitate adhesion and/or as a primer and which has a maximum thickness of a few μm , is applied to the metal layer (2, 12, 32),

c) a coat of varnish (4, 14, 34) containing a binding agent which is IR-transmissive and/or a colour printing containing such a binding agent is applied to the protective layer (3, 13, 33) as a coating with a thickness of a few 10 μm and is or are largely transparent in the wavelength range from 4 to 20 μm but appears or appear coloured in the wavelength range from 0.4 to 0.8 μm , and

d) the metal layer (2, 12, 32) has hairline cracks which make the surface conductivity of the metal layer (2) practically ineffective.

2. A wall-paper as claimed in claim 1, characterised in that the coat of varnish (4) or the colour printing contains colouring agents which are dissolved in the binding agent and which are only absorbing or reflecting in visible light.

3. A wall-paper as claimed in claim 1 or 2, characterised in that the coat of varnish (4) or the colour printing contains pigments which are embedded in the binding agent and which have a coloured effect in the visible range in known manner.



4. A wall-paper as claimed in one of the Claims 1 to 3, characterised in that different colour tints and patterns are produced in the colour printing, by the selection of suitable colour pigments and the selection of suitable coloured binders, in one or more printing operations.

5. A wall-paper as claimed in one of the Claims 1 to 4, characterised in that the supporting material (11) is applied to an embossed, burled or corrugated web (15), which consists of thermally insulating material and includes air spaces and which carries a layer of adhesive at the attachment side.

6. A wall-paper as claimed in one of the Claims 1 to 5, characterised in that two or more layers, each consisting of a laminated arrangement as claimed in Claim 1, are connected to one another by embossed, burled or corrugated intermediate supports (15) of paper or plastics material, which include air or gas spaces.

7. A wall-paper as claimed in one of the Claims 1 to 5, characterised in that the supporting material (31) consists of a thin special paper which is covered with a thin coat of primer (39) to which the metal layer (32), the protective coat of varnish (33) or layer of colour printing and the coat of varnish (34) or the colour printing are applied, and that the supporting material (31) is applied to a backing wall-paper (37) by means of a layer of bonding adhesive (38).



8. A wall-paper as claimed in Claim 6, characterised in that the backing wall-paper (37) is selected in the order of magnitude of 100 to 200 g/m², the thin special paper (31) which is coated with the coat of primer (39) on one side is selected in the order of magnitude from 10 to 50 g/m² and the intervening layer of bonding adhesive (38) is of the order of magnitude of 10 µm thick.

9. A wall-paper as claimed in Claim 7 or 8, characterised in that the layer of bonding adhesive (38) consists of a layer of plastics material which makes the combination of layers of paper consisting of the supporting material (31) and the backing wall-paper (37) flexible as a result of its resilience, reduces the inflammability and protects the metal layer (32) from alkaline components emerging from the masonry.

10. A wall-paper as claimed in Claim 9, characterised in that the layer of plastics material consists of poly-vinyl chloride.

11. A wall-paper as claimed in one of the Claims 1 to 10, characterised in that the protective layer (3) has a thickness of about 0.5 µm.

French Claims

1. A wall-paper or wall covering which reflects heat, comprising a support (1, 11, 21, 31) of paper or of synthetic material, possibly provided with an adhesive, coated by metallization on one or both sides with a thin



metallic layer (2, 12, 22, 32) and covered with a layer (4, 14, 34) which is transparent in the infrared spectral range but coloured in the visible spectral range, characterised by the combination of the following features:

a) the metallic layer (2, 12, 32), the thickness of which is less than 30 nm, is applied to the support (1, 11, 31),

b) a protective layer (3, 13, 33) with a maximum thickness of a few μm , which layer serves as an attachment agent and/or as a first coat and protects the metallic layer from corrosion, is disposed on the metallic layer (2, 12, 32);

c) applied to the protective layer (3, 13, 33), as a covering layer, is a varnish (4, 14, 34) containing a binder permeable to infrared and/or a colour printing containing this binder and having a thickness of some 10 μm ; this varnish or this printing is largely transparent in the range of wavelengths from 4 to 20 μm but is coloured in the range of wavelengths from 0.4 to 0.8 μm ;

d) the metallic layer (2) has microcracks which make the conductivity of this metallic layer (2) practically ineffective.

2. A wall-paper as claimed in Claim 1, characterised in that the varnish (4) or the colour printing contains colorants dissolved in the binder and which are only reflecting or absorbing in visible light.



3. A wall-paper as claimed in either one of the Claims 1 and 2, characterised in that the varnish (4) or the colour printing contains pigments embedded in the binder and acting, as is known, in a coloured manner in the optico-visual range.

4. A wall-paper as claimed in any one of the Claims 1 to 3, characterised in that different tints and designs are formed in the colour printing by an appropriate selection of pigments and of coloured binders and this is done in one or more printing operations.

5. A wall-paper as claimed in any one of the Claims 1 to 4, characterised in that the support (11) is applied to an embossed, burled or corrugated web (15) consisting of a thermally insulating material, enclosing air spaces and having a layer of adhesive on the attachment face.

6. A wall-paper as claimed in any one of the Claims 1 to 5, characterised in that two or more assemblies, each formed from a combination of layers in accordance with Claim 1, are connected to one another by intermediate supports (15) of paper or synthetic material, which are embossed, burled or corrugated and enclose gas or air spaces.

7. A wall-paper as claimed in any one of the Claims 1 to 5, characterised in that the support (31) consists of a thin special paper which is covered with a thin layer of superficial mastic (39) on which are deposited the



metallic layer (32), the protective coat of varnish (33) or the colour printing layer and the varnish (34) or colour printing; and in that the support (31) is applied, by means of a layer of lining adhesive (38), to an unfinished wall-paper (37).

8. A wall-paper as claimed in Claim 6, characterised in that the unfinished wall-paper (37) has a weight of the order of magnitude of 100 to 200 g/cm²; in that the thin special paper (31), coated on one side with the layer of superficial mastic (39), has a weight of the order of magnitude of 10 to 50 g/m²; and in that the layer of lining adhesive (38) situated in between has a thickness of the order of magnitude of 10 µm.

9. A wall-paper as claimed in any one of the Claims 7 and 8, characterised in that the layer of lining adhesive (38) consists of a layer of synthetic material making the combination of layers consisting of the support (31) and of the unfinished wall-paper (37) flexible because of its resilience, reducing the inflammability and protecting the metallic layer (32) from the alkaline constituents emanating from the masonry.

10. A wall-paper as claimed in Claim 9, characterised in that the layer of synthetic material consists of poly-vinyl chloride.



11. A wall-paper as claimed in any one of the Claims 1 to 10, characterised in that the protective layer (3) has a thickness of about 0.5 μm .