(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) Publication number: **0 391 576 A1**

(12) EUROPEAN PATENT APPLICATION

(21) Application number: **90303040.1**

(22) Date of filing: **21.03.90**

(51) Int. Cl.5: **B41M 3/18, B41M 3/06, B44F 1/08**

(30) Priority: **21.03.89 GB 8906416**

(43) Date of publication of application: **10.10.90 Bulletin 90/41**

(84) Designated Contracting States: **BE DE ES FR GB IT NL SE**

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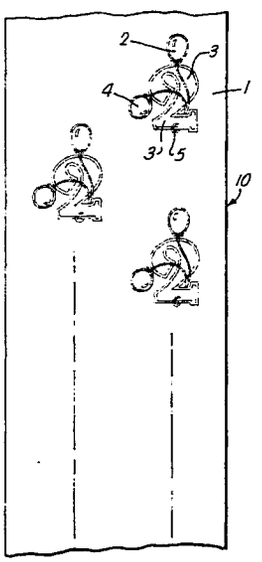
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(54) Wallcoverings.

(57) Wallcovering 10 comprises a paper or other substrate that can have a pale background 1 and that carries printed areas 2, 3 and 4 of material that is visible in daylight surrounded by a pattern of lines 6 of photoluminescent material that is preferably applied by rotary screen printing.

Fig.1.



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Wallcoverings

Wallcovering is provided as a continuous length of material that is usually referred to as wallpaper, even though the sheet substrate can be of material other than paper, for instance hessian. The continuous length is supplied to the user as a roll. Sometimes wallpaper border material is provided in order to add an extra pattern to the wall, but again the border is provided as a continuous length of material.

The wallcovering usually carries decoration that comprises printed areas of coloured material viewable by reflected light. The result is that the material appears attractive in daylight or artificial light but at night time, when there is no applied illumination, the decoration cannot be seen.

An essential feature of wallcovering is, of course, that it should be easy to apply it accurately to the wall from the roll-form in which it is supplied. Occasionally other decoaration is applied to the walls, for instance in small pieces of decoration, such as coloured cut-outs, but it is exceedingly difficult to make a regular overall pattern from these and so these are not particularly relevant to continuous wallcoverings. Generally the colouring in the cut-outs is also viewable only by reflected light, so again it is invisible at night time.

There are of course materials that do not require daylight or visible light in order for them to be viewable. Thus fluorescent materials will absorb light at one wavelength and emit it at a different wavelength. In particular, fluorescent materials that absorb ultra-violet dark light re-emit it as visible light. At night time therefore they will give a viewable image but only if an ultra-violet black illumination is provided.

Photo-luminescent materials absorb irradiation and store it, and re-emit it later, for instance after the source of irradiation has terminated. Thus they will absorb visible light (either daylight or artifical light) and then when there is darkness (without any ultra-violet or other artificial irradiation) the emission from the photoluminescent material is visible for a short while and gradually fades, for instance after a few minutes or, in some instances, an hour or more.

These various materials have, of course, been used for various functional and decorative images and in particular it is known to print photoluminescent material on to pieces that are to be cut out and then stuck to the walls.

This has not proved very attractive, for instance for childrens rooms or other domestic decoration, for a number of reasons. The photoluminescent material has poor colouring properties. If the photoluminescent material is applied over conventional coloured material then the colouring effect will be impaired, and the clarity of the lower colour may be adversely affected. If the photoluminescent material is mixed into an ink with the coloured material then again the colour may be aversely affected but, in particular, the photoluminescent effect will be greatly reduced.

In most instances where photoluminescent material has been provided in cut-outs or other decorations, the pattern has usually included large areas of photoluminescent material. If enough photoluminescent material is provided to give any prolonged duration of photoluminescence, the initial brightness of the large areas can be so high as to create a rather overwhelming effect.

Another problem with photoluminescent materials is that the photoluminescent pigments tend to have such a coarse particle size that many conventional printing techniques are inappropriate.

There is, of course, a large amount of literature demonstrating the well known and old fact that fluorescent or photoluminescent material can be applied to a substrate and examples appear in GB 2,147,542, U.S. 2,277,169, 3,011,978, 4,044,176 and 4,652,464, FR 1,025,985 and 2,031,122 and AU 550,467 and 518,156, and Patent Abstracts of Japan Volume 9 No.158 (M398) 1881 3rd July 1985.

Many children and babies need relaxation when going to sleep and can dislike being put into sudden darkness and losing sight of the patterns in the wallcovering around them. However fluorescent decoration is obviously inappropriate because it would need the application of black ultra-violet light, which is unacceptable in a child's bedroom, and the photoluminescent cut-outs that have been available are, as indicated above, crudely executed and inapplicable to overall decoration of a child's bedroom.

As a result, photoluminescent decorations for, for instance, childrens bedrooms and nurseries have not been adopted widely.

It would therefore be desirable to provide wallcoverings for nurseries, childrens bedrooms and similar environments which are aesthetically pleasing in daylight and are also visible in the dark, without imposed ultra-violet light, and which incur no risk of scaring children in the dark and which can easily be applied to the walls in a pleasing manner.

According to the invention, we provide wallcovering that is a continuous length of material that can be wallpaper or wallpaper border and that carries a decoration comprising first printed areas formed of coloured material viewable by reflected

light and second printed areas that are formed of photoluminescent material and that are wholly or mainly lines or dots and that are substantially non-overlapping with the first areas.

The second printed areas may or may not form part of the design when seen by reflected light. They will, however, constitute the total design when seen in the dark (without the need for imposed dark ultra-violet radiation).

The first printed areas can thus be formed of conventional coloured material that is selected from conventional pigments and dyes having regard to the colour that is required to be seen during normal daylight or artificial light.

The second printed areas are formed of photoluminescent material and must, of course, not be covered by the coloured material of the first areas.

The second areas are wholly or mainly dots or lines that substantially do not fall on top of the printed first areas except where a white or light coloured first area is used in register with the second area. For instance sufficent of the total amount of the first areas should remain uncovered in order that the selected coloured material of the first areas gives the predominant visual impact in normal light, substantially without any second areas interfering with the visual impact of the first areas.

Generally at least 50%, and usually substantially all, of the area of the lines or dots of the second areas do not overlap the first areas. Any second area that is printed over a first area is preferably over a pale or white first area so as to avoid interfering with strong colours.

It is particulary preferred that the second areas should comprise a line drawing on a white or pale background around the edges of first areas of darker colour or colours. Thus a pattern can be viewable in normal light as a pattern of overall coloured first areas the appearence of which is not significantly affected by any adverse appearence of the photoluminescent ink, and in darkness the pattern is viewed as a substantially identical out-line pattern.

It is important that the dots or lines should constitute most or all of the second printed areas since large "solid" printed areas of photoluminescent material are liable to appear too bright to some children, and also the large areas of photoluminescent material may impart inferior appearance to the overall pattern when viewed in daylight. However of course some such areas can be present, provided the overall effect is predominantly an effect of a line or dot pattern.

In order that the second areas are not normally and readily visible in ordinary light, and in order that the pattern has the desired appearance in the dark, it is preferable that the dots or lines should be relatively small, for instance having a maximum width normally below 10 and preferably below 5mm, typically around 1 or 2mm. They are preferably spaced apart by coloured material that is wider than the dots or lines of the photoluminescent material.

Although it is preferred that the second areas should give a line decoration that is substantially the same as the coloured first areas, the overall decoration can of course include first areas that are not associated with lines or dots of photoluminescent material and/or second areas that are not associated with coloured first areas. As a result some parts of the pattern may be visible only in normal light and some parts only visible in the dark.

The wallcovering is made by printing the first areas and the second areas on to a paper or other suitable substrate. Preferably the second areas are printed at the last printing station on the printing machine that is used. Some of the printing techniques that might normally be considered include techniques such as gravure, flexography and lithography, but these tend to be unsatisfactory for printing the second areas. Preferably a screen printing technique should be used, most preferably rotary screen printing. The first areas can be applied by the same technique or by, for instance, gravure in conventional manner. A prepaste coating can be applied on to the reverse side of the substrate in conventional manner during the production of the wallcovering.

The coloured material and the photoluminescent material must be individually formulated as inks having suitable rheology and other characteristics such that they can satisfactorily be printed by the chosen methosd on to the chosen substrate. The formulation of the inks of the coloured material and of the photoluminescent material can be conventional.

The photoluminescent material may be a sulphide such as zinc sulphide (which is particularly convenient for non-toxic applications such as childrens bedrooms and nurseries) or metal complexes based on zinc, cadmium, calcium or strontium supphides with copper, cobalt or bismuth. It is essential to avoid undesirable reduction in the particle size of the pigment, as this can reduce the photoluminescent effect. Although the concentration of photoluminescent pigment in the ink can be relatively high, e.g., 50% pigment W/W, the overall usage is low because the ink is only applied as a line or dot pattern.

After printing the inks, the printed substrate may be heated to effect drying and/or curing in the normal way. The coloured ink (but preferably not the photoluminescent ink) may comprise a foamable PVC plastisol or other foamable binder system

in which event the heating will include a heating stage at a temperature sufficient to cause foaming but not adversely affect the photoluminesence.

The invention is illustrated in the accompanying drawings in which:

Figure 1 is a plan view of part of a continuous length of wallcovering (showing part only of the pattern on it),

Figure 2 shows the first areas in part of the pattern,

Figure 3 shows the second areas in part of the pattern, and

Figure 4 shows the combination of first and second areas in that part of the pattern, as it appears in the wallcovering of Figure 1.

In particular, the wallcovering of Figure 1 comprises a continuous length 10 of a sheet material having an overall pale background 1 and a regularly arranged, recurring pattern of images as shown in detail in Figure 4.

Within each of these images, there are first printed areas 2, 3 and 4 (each being of different colour and each being a continuous layer of colour) over a pale background 1 and seperated from the background by white areas 5. By saying that the background is pale, we mean that it is noticeably paler than prominent parts of the first printed areas, so that it appears paler than the first areas. Part of the pale background can be printed as a pattern on to an overall background (e.g., white on a cream colourwash).

There are also second printed areas in the form of a line pattern 6. This surrounds areas 2, 3 and 4 and is within the white areas 5. In order to clarify Figure 1, the details of areas 5 and 6 are not shown in Figure 1.

In daylight, the predominant visual impact is by the pattern of areas 2, 3 and 4 against the background 1, with areas 5 providing a weak contrast that is not dependent for its impact on the clarity of its colour. In darkness, the line pattern 6 gives the visual impact.

Rather than having a pattern made up of numerals, it is often preferred that it should be of, for instance, nursery animals in which event lines of photoluminescent material can trace their outlines and dots of photoluminescent material can be, for instance, present to represent the eyes or to suggest background starlight.

Claims

1. Wallcovering that is a continuous length of material selected from wallpaper and wallpaper-border and that carries a decoration comprising first printed areas formed of coloured material viewable by reflected light characterised in that the decoration includes second printed areas that are formed of photoluminescent material and that are wholly or mainly lines or dots and that are substantially non-overlapping with the first areas.

2. Wallcovering according to claim 1 wherein the second printed areas comprise a line drawing around the edges of first printed areas.

3. Wallcovering according to any preceding claim wherein the said dots or lines have a maximum width of 5mm.

4. Wallcovering according to any preceding claim in which the second printed areas have been applied by rotary screen printing.

5. Wallcovering according to any preceding claim wherein the second printed areas are on a white or pale background.

6. Wallcovering according to any preceding claim wherein the photoluminescent material comprises zinc sulphide.

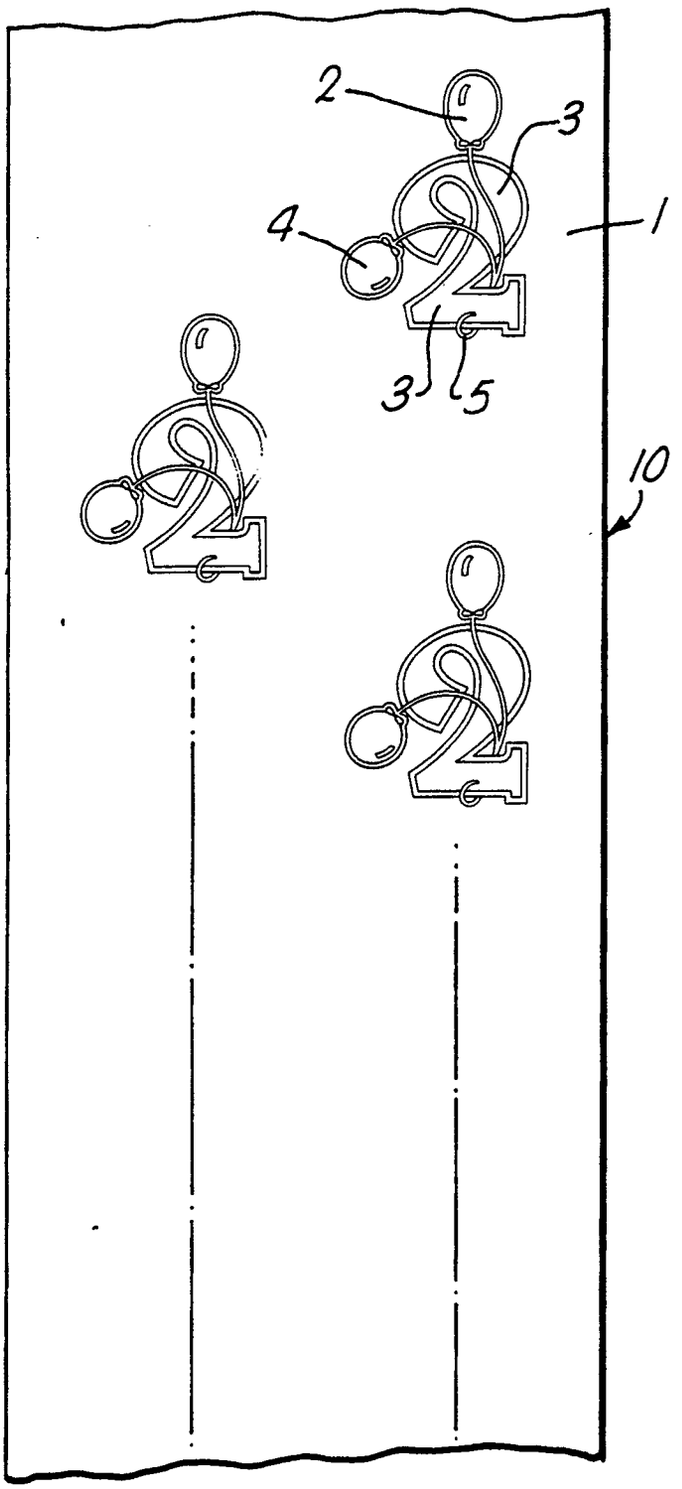
7. Wallcovering according to any preceding claim wherein the first areas are formed from coloured ink which comprises a foamable binder system.

8. Wallcovering according to any preceding claim comprising a white or pale background and in which the second areas are printed on the white or pale background and have a maximum width of below 5mm and comprise a line drawing around the edges of the first areas.

9. A process for preparing wallcovering according to any preceding claim by printing the first and second areas on to a wallcovering substrate wherein the second areas are printed at the last printing station on the printing machine.

10. A process according to claim 9 wherein rotary screen printing is used for printing the second areas.

Fig.1.



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Fig.4.

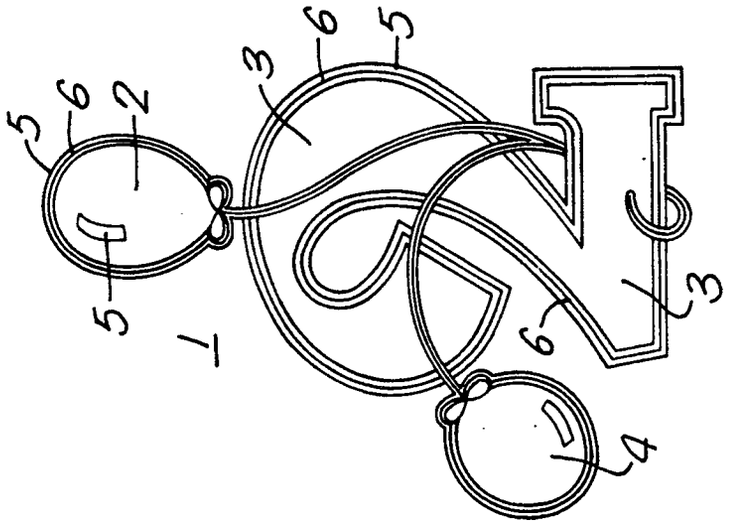


Fig.3.

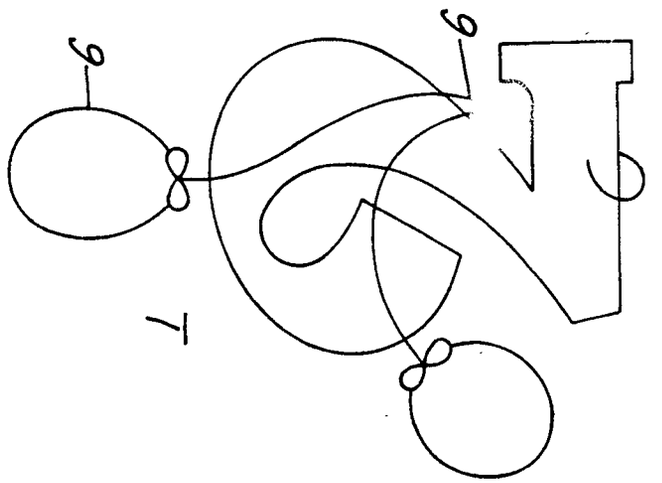
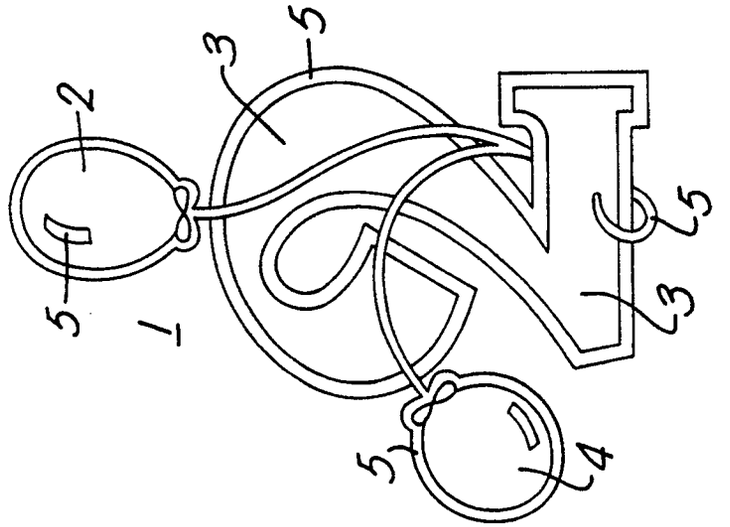


Fig.2.



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EUROPEAN SEARCH REPORT

Application Number

EP 90 30 3040

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl.5)
Y	DE-C-907633 (MAX GRÄFF) * the whole document *	1-9	B41M3/18 B41M3/06 B44F1/08
Y	US-A-4745286 (B.R.JONES) * the whole document *	1-9	
Y	DE-A-2215986 (J.HORST ET AL.) * the whole document *	1-9	
Y,D	US-A-3011978 (E.J.GOSNELL ET AL.) * the whole document *	6	
Y	FR-A-2031122 (ICI) * the whole document *	7	

TECHNICAL FIELDS SEARCHED (Int. Cl.5)

B41M
B44F
B44C
D21H

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	06 JULY 1990	RASSCHAERT A.

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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