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(54) **Marking of articles.**

(57) An article has a marking applied to a selected area of the surface of the article, the marking being composed of a vitrified material which is indistinguishable from the surface of the article when viewed in visible light but which fluoresces when subjected to ultra-violet light. The marking may comprise a bar code or an identification marking consisting of alpha-numeric characters. These are preferably in computer print form and superimposed upon a backstamp identifying the article as originating from a particular manufacturer. The arrangement is particularly but not exclusively applicable to ceramic products.

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Marking of Articles

This invention relates generally to the marking of articles for identification purposes. The invention has been devised primarily for use in the marking of pieces of ceramic ware but may be used in relation to other articles.

Many manufacturers of quality ceramic ware periodically produce limited edition pieces which are of high quality, produced in relatively small numbers and therefore of high value. Such pieces are commonly individually numbered but conventional methods of numbering may be easily tampered with by thieves or others coming into possession of stolen pieces.

Most manufacturers of ceramic products identify their products by means of a marking applied to an underside of each product. Such markings commonly consist of or incorporate a Trade Mark and are referred to in the trade as "backstamps". In some cases second quality ware is marked with a modified backstamp in which certain areas of the first quality backstamp are removed. However attempts are sometimes made to alter such modified backstamps by re-introducing copies of the removed areas so as to pass-off the goods as being of first quality.

It is a common practice in many fields to identify individual articles for stock control and other purposes

with a marking in the form of a series of parallel lines or bars, known as a "bar code". However bar coding of ceramic articles has hitherto proved impracticable due firstly to the problem of applying a bar code to such articles which will retain sufficiently fine detail after firing of the articles during production, and secondly to the fact that the presence of the bar coding on the surface of such articles is not visually acceptable.

It is an object of the present invention to provide means for marking articles in a manner which will obviate or mitigate at least some of the problems referred to above.

It is known to mark articles with identification markings in inks which are invisible to the eye in visible light but fluoresce and become visible when subjected to ultra-violet (or U.V.) light. However such marking inks may be readily removed by application of abrasives or solvents and will not withstand the high firing temperatures employed in the production of ceramic articles. Such markings cannot therefore be applied to such articles in the course of production.

We have now found that certain fluorescent materials may be employed to produce a printing medium or product which will withstand ceramic firing temperatures and may therefore be used to apply an identification marking to such articles during manufacture.

According to one aspect of the invention there is

provided an article having a marking applied to a selected area of the surface of the article, said marking being composed of a vitrifiable material which is indistinguishable from the surface of the article when viewed in visible light but which fluoresces when subjected to ultra-violet light.

The term "vitrifiable" is used herein and in the appended claims to refer to materials which are not decomposed when subjected to temperatures used in the firing of ceramic or glass articles, typically of the order of 450-1300°C. The term "visible light" is used herein and in the appended claims to refer to light within the visible spectrum.

The marking may comprise a security coding consisting of a series of identifiable characters. The characters may comprise elements of a bar code or alpha numeric characters preferably in computer print form. Alternatively the marking may comprise selected areas of a pattern or of a backstamp applied to the article. In a preferred arrangement the article is marked with a backstamp identifying the product as originating from a particular manufacturer and having an identity or security marking superimposed thereon.

The term "computer print form" is used herein and in the appended claims to refer to a print or type style in which all the letters or numerals are formed from the same series of vertical, horizontal and inclined strokes, selected combinations of which are employed to form the desired alpha-numeric characters required. The

term "alpha/numeric" is used herein and in the appended claims to refer to characters which may consist either solely of letters of the alphabet, solely of numerals or of a combination of both.

Where the marking comprises alpha-numeric characters in computer print form, those parts of each character forming the identification marking are preferably constituted by a fluorescent material of a first fluorescent colour, the remaining portions of each character being formed from a non-fluorescent material or from a fluorescent material of a different fluorescing colour.

The term "fluorescing colour" is used herein and in the appended claims to refer to the colour of the fluorescent material when viewed under ultra-violet light and does not refer to the colour of the material when viewed in visible light. Where reference is made to colours other than fluorescing colours such references should be interpreted as referring to colours as they appear in normal light.

Advantageously the identification marking may be applied over the conventional backstamp traditionally applied to the underside of ceramic articles to identify their manufacturer.

The fluorescent material may comprise a rare earth material. Suitable examples include lanthanides such as ytterbium and europium. Other suitable materials include vanadates, molybdates, zinc sulphide, copper activated zinc sulphide, uranium oxide, wollastonite and

willemite. The fluorescent material is preferably incorporated in a decorating ink medium which may be applied to the surface of the article by printing, by means of a decal or transfer or in any other suitable manner at an appropriate stage in the manufacturing process.

Thus the invention also provides a vitrifiable decorating material for use in applying a marking to a ceramic article, the decorating material comprising a carrier medium, a vitrifiable material which fluoresces when subjected to ultra-violet light, a flux and a pigment or dye, the decorating material being capable of withstanding a firing temperature in the region of 450-1300°C.

According to a further aspect of the invention there is provided a decal or transfer comprising a carrier sheet, an image layer incorporating a marking in a decorating medium incorporating a vitrifiable material which fluoresces under ultra-violet light, and a support layer releasable from said carrier sheet with said image layer attached thereto to enable the image layer to be transferred to the surface of an article and attached thereto by firing.

The design layer may be applied between the carrier sheet and the support layer or over the support layer. The transfer may incorporate additional protective layers or additional layers for other purposes, for example to facilitate application of the transfer to articles of ware by automatic means.

The vitrifiable materials may comprise rare earth materials. Suitable examples include lanthanides such as ytterbium and europium. Other suitable materials include vanadates, molybdates, zinc sulphide, copper activated zinc sulphide, uranium oxide, wollastonite and willemite. Said flux is preferably selected from a range of glasses formed from silica, boron, lead oxide, soda or potash.

According to a further aspect of the invention there is provided a tamper resistant backstamp for an article of ware at least one zone of the backstamp having areas printed in a material which fluoresces when subjected to ultra-violet light, whereby following authorized removal of such zone unauthorized replacement of the removed material is detectable by the absence of the fluorescent areas.

The invention also provides a method of marking an article comprising applying to a selected area of the surface of the article a marking in a vitrifiable material which is indistinguishable from the surface of the article when viewed in visible light but which fluoresces when subjected to ultra violet light, and subjecting the article with the marking thereon to a firing operation to vitrify said material and bond the marking to the surface of the article.

Embodiments of the invention will now be described, by way of example only, with reference to the accompanying drawings, in which:

Fig. 1 is a transverse cross-section through an

example of a transfer or decalcomania according to the invention;

Fig. 2 is an illustration of a security marked backstamp for a pottery article;

Fig. 3A shows portions of a security marking applied in one form of decorating medium;

Fig. 3B shows complimentary portions of the same security marking formed in a different decorating medium;

Fig. 3C shows the effect obtained when the markings of Figs. 3A and 3B are superimposed;

Fig. 4 shows a backstamp and security marking as they appear when viewed under ultra-violet light;

Fig. 5 shows a marking in the form of a bar coding; and

Fig. 6 shows a backstamp having selected areas marked to hinder tampering.

Fig. 1 shows a decal or transfer suitable for application to an article of ceramic ware and subsequent glazing and/or firing to fuse the transferred image on to the surface of the ware. The transfer comprises a carrier paper 10 surmounted by a release layer 12 serving to facilitate removal of the upper part of the transfer from the carrier sheet 10. The release layer may be activated in any desired manner to effect separation, for example by dissolving in water or melting on application of heat.

Surmounting the release layer is an image layer 13 the construction of which will be described more fully

hereafter. If desired the image layer may be covered with a protective layer 14, for example a transparent flux, to increase resistance to tampering after firing. The transfer is covered with a final coating layer 15 which acts as a carrier vehicle to maintain the integrity of the image layer during transfer to an article and which volatilizes during subsequent firing.

The image layer of the transfer incorporates a design, pattern, backstamp or the like to be applied to an article of ceramic ware. In the embodiment described with reference to the drawings, the image layer incorporates a backstamp in the form of a Trade Mark identifying the products as originating from a particular manufacturer. The Trade Mark shown in Fig. 2 is a Registered Trade Mark of Doulton & Company Limited. The Trade Mark is printed on to the release layer 12 using a printing medium capable of withstanding the firing temperatures encountered in the production of ceramic products and incorporates printed wording indicating that the article concerned is security coded.

In order to apply a security marking to the surface of the article, a separate transfer is produced. In the illustrated arrangement the image layer of this transfer incorporates a security coding different parts of which are printed in different materials as shown in Fig. 3 of the drawings. In the example the security coding consists of numerals but may equally consist of letters or a combination of numerals or letters. The numerals are formed from characters in computer print

form and are printed using a printing ink which is substantially transparent when viewed in visible light so that the background colour of the article of ware to which the security marking is to be applied shows through the marking in visible light. Consequently save for slight projection of the characters above the surrounding surface they are not discernible to the naked eye when applied to the article. Moreover since the characters are printed as digits in computer print form they appear, if discernible, by virtue of their projection above the surrounding surface, to consist of a series of the numeral "8" as shown in Fig. 3C. Since many ceramic articles are translucent the opacities of the printing inks employed are preferably substantially the same such that the marking also appears as a series of "8"'s when viewed in light transmitted through the article from a light source placed behind or within it.

Those portions of the coding shown in Fig. 3A of the drawings are printed using a printing medium incorporating products which fluoresce in a selected colour under ultra-violet light. Those portions of the security coding shown in Fig. 3B of the drawings are also printed in a material which fluoresces under ultra-violet light but which fluoresces in a different colour. Consequently when the security marking is subjected to ultra-violet light the marking becomes immediately readable as the series of numbers shown in Fig. 3B, the remaining portions showing as a different

colour and not contributing to identification of the marking.

The fluorescent materials employed in the printing medium may comprise rare earth materials. Suitable examples include lanthanides such as ytterbium and europium. Other suitable materials include vanadates, molybdates, zinc sulphide, copper activated zinc sulphide, uranium oxide, wollastonite and willemite. The materials are incorporated in the decorating medium in such ranges and proportions as to produce materials which are essentially transparent when viewed in visible light but fluoresce in the selected different colours when viewed under ultra-violet light. Typically printing inks for each part of the coding are formed from a mixture of 15-25% by weight of a flux material consisting of or incorporating for example, lead oxide, boron, flint or other forms of silica and 45-75% by weight of a mixture of fluorescent materials selected from those referred to above. The balance of the composition consists of pigment or dye and a diluent or carrier such as an alkyd resin which is burnt off during subsequent firing. Different fluorescent materials are incorporated in the two inks so that the parts of the markings shown in Figs 3A and 3B will fluoresce in different colours.

Printing of the respective parts of the security coding may be effected using any suitable technique such as screen printing or the like, and following printing of the image layer the transfer is completed by

application of protective and coating layers as described with reference to Fig. 1. Thereafter the transfer is released from the carrier sheet, applied to the surface of the article in a suitable position, and subsequently fired. The transfer may be applied to the "biscuit" fired article prior to glazing and subsequent firing or may be applied after glazing and subjected to a subsequent "on glaze" firing.

The security marking may be applied at any desired part of the article but for maximum effectiveness it is preferred that the security marking be applied over the conventional backstamp. This is shown in Fig. 4 of the drawings which illustrates the appearance of such a marking when viewed through ultra-violet light. The marking is produced in the manner described with reference to Figs. 3A and 3B but is placed over the backstamp after the latter has been applied and either before or after subsequent glazing and final firing. Tampering with a marking of this kind is extremely difficult since attempts to tamper with the security marking inevitably result in defacing of the backstamp thereby making it immediately apparent that the article has been interferred with.

In an alternative embodiment shown in Fig. 5 of the drawings the identification marking comprises a bar coding consisting of a series of parallel bars of equal height but of different width. The bars or the spaces between them are printed in a material which fluoresces under ultra-violet light. Alternatively they may be

formed by printing bars in non-fluorescent material on to a block of fluorescent material, thereby producing a series of alternating fluorescent and non-fluorescent bars. In this way when viewed under visible light the coding is not readily visible. When subjected to ultra-violet light however, the markings fluoresce to define the coding. Tampering is rendered difficult as it would require application of fluorescent materials and subsequent heating or firing thereby rendering the changes discernible and less permanent than the original marking. It would also be difficult to maintain the necessary accuracy to render the tampered code readable. If desired the spaces between the bars may be printed in a non-fluorescent material to minimize the extent to which the bar code would be recognizable as such if discernible due to projection from the surface of the article. Still further security may be attained by superimposing bar coded identification markings of this kind on a backstamp in the manner shown in Fig. 4 of the drawings. In an alternative arrangement the bars may be replaced by a series of concentric circles alternately fluorescent and non-fluorescent.

Fig. 6 of the drawings shows a further embodiment adapted to prevent tampering with ware which has already had an altered backstamp applied thereto. In some situations products of second quality are marketed bearing a modified backstamp in which some information appears but other details have been removed in order to enable the ware to be distinguished from first quality

goods. Attempts are sometimes made to reinstate the material removed from such backstamps in order to deceive purchasers into the belief that the goods are of first quality. The arrangement shown in Fig. 6 of the drawings assists in preventing tampering of this kind by utilizing as a normal first quality backstamp a device in which certain regions such as, for example, those indicated at 20 are formed of vitrifiable material which fluoresces under ultra-violet light. In the normal backstamp applied to first quality products these areas will fluoresce when the backstamp is examined under ultra-violet light. When the backstamp is modified for use on second quality ware a region of the backstamp including the fluorescent material is removed. Subsequent unauthorized modification of the backstamp to reinstate the outline of the removed matter and hence render the backstamp similar to that used on first quality ware then becomes detectable since when the article is examined under ultra-violet light the zones 20 will not fluoresce and the item will be revealed as not bearing a genuine first quality backstamp.

It is of course possible that expert forgers could attempt to re-create authentic articles or modify identification codes by utilizing vitrifiable materials which fluoresce under ultra-violet light. Such forgery would however be extremely difficult and even if effected using appropriate materials would be detectable from the original product since the forged alterations would have been effected subsequent to final firing of

the article and would require to be fired on in a separate operation. There would therefore be discernible differences between those parts of the coding which were original and those parts which had been tampered with. Alteration is particularly difficult in the case of those codings which have regions formed of two different fluorescing materials and which are superimposed on a backstamp.

By virtue of the arrangements described there is provided a means whereby articles may be marked in a manner which is not readily ascertainable from visual inspection but can be identified under ultra-violet light. Tampering with the marking is inhibited by the use of materials which fluoresce in different colours under ultra-violet light and can be made still more difficult by superimposing the marking over a conventional backstamp.

Various modifications may be made without departing from the invention. For example while it is preferred to apply the identification marking over a backstamp or the like it may be applied to a different area of the product. Moreover while it is preferred to employ ultra-violet fluorescent materials of different colours to form different portions of the identification marking a single colour of fluorescent material may be employed in combination with a non-fluorescent material. Identification codes may also be applied using alpha-numeric characters not in computer print form or using other characters or

symbols. Moreover while reference has been made herein primarily to the application of markings to ceramic articles, the invention is also applicable to the marking of paper, plastic or other non-ceramic materials.

Whilst endeavouring in the foregoing specification to draw attention to those features of the invention believed to be of particular importance it should be understood that the Applicant claims protection in respect of any patentable feature or combination of features hereinbefore referred to whether or not particular emphasis has been placed thereon.

CLAIMS:

1. An article having a marking applied to a selected area of the surface of the article said marking being composed of a vitrified material which is indistinguishable from the surface of the article when viewed in visible light but which fluoresces when subjected to ultra violet light.

2. An article according to claim 1 wherein said marking comprises an identification marking consisting of identifiable characters.

3. An article according to claim 2 wherein the characters comprise elements of a bar code.

4. An article according to claim 2 wherein the characters comprise alpha-numeric characters in computer print form.

5. An article according to claim 1 wherein said marking comprises selected areas of a pattern applied to the article.

6. An article according to claim 1 wherein said marking comprises selected areas of a backstamp applied to the article.

7. An article according to any of claims 1 to 4 which

is marked with a backstamp identifying the article as originating from a particular manufacturer, said marking being superimposed on said backstamp.

8. An article according to 4, or claim 7 when dependent on claim 4, wherein those parts of each character forming the identification marking are constituted by a fluorescent material of a first fluorescent colour, the remaining portions of each character being formed from a non-fluorescent material or from a fluorescent material of a different fluorescing colour.

9. An article according to claim 3 wherein the areas between the bars of said bar coding are printed in a non-fluorescent material whereby to minimize the extent to which the bar code is discernible due to projection from the surface of the article.

10. An article according to any preceding claim wherein the or each fluorescent material comprises a rare earth material.

11. An article according to any preceding claim wherein said material is selected from lanthanides including ytterbium and europium, vanadates, molybdates, zinc sulphide, copper activated zinc sulphide, uranium oxide, wollastonite and willemite or combinations thereof.

12. An article having a marking applied thereto substantially as hereinbefore described with reference to Figs. 3A to 3C or Fig. 4 or Fig. 5 or Fig. 6 of the accompanying drawings.

13. A method of marking an article comprising applying to a selected area of the surface of the article a marking in a vitrifiable material which is indistinguishable from the surface of the article when viewed in visible light but fluoresces when subjected to ultra violet light, and subjecting the article with the marking thereon to a firing operation to vitrify said material and bond the marking to the surface of the article.

14. A method according to claim 13 wherein said fluorescent material comprises a rare earth material.

15. A method according to claim 13 or 14 wherein the material is selected from lanthanides including ytterbium and europium, vanadates, molybdates, zinc sulphide, copper activated zinc sulphide, uranium oxide, wollastonite and willemite or combinations thereof.

16. A method according to any of claims 13 to 15 wherein said fluorescent material is incorporated in an ink medium.

17. A method according to claim 16 wherein said ink medium is applied to the surface of the article by printing thereon during manufacture of the article.

18. A method according to claim 17 wherein said ink medium is applied to a decal or transfer which is then applied to the surface of the article during manufacture of the article.

19. A method of marking an article substantially or hereinbefore described.

20. An article produced by the method according to any of claims 13 to 19.

21. An article according to claim 16 which is made from ceramic material.

22. A vitrifiable decorating material for use in applying a marking to a ceramic article, the decorating material comprising a carrier medium, a vitrifiable material which fluoresces when subjected to ultra-violet light, a flux and a pigment or dye, the decorating material being capable of withstanding a firing temperature in the region of 450-1300 °C.

23. A vitrifiable decorating material according to claim 22 wherein said vitrifiable material comprises a rare earth material.

24. A vitrifiable decorating material according to claim 22 or 23 wherein said rare earth material is selected from lanthanides including ytterbium and europium, vanadates, molybdates, zinc sulphide, copper activated zinc sulphide, uranium oxide, wollastonite and willemite or combinations thereof.

25. A vitrifiable decorating material according to any of claims 22 to 24 wherein said flux is selected from glass compositions formed from silica, boron, lead oxide, soda or potash or combinations thereof.

26. A vitrifiable decorating material according to any of claims 22 to 25 wherein said carrier medium comprises an alkyd resin.

27. A vitrifiable decorating material according to any of claims 22 to 26 comprising 15-45% by weight of flux and 45-75% by weight of fluorescent material.

28. A vitrifiable decorating material substantially as hereinbefore described.

29. An article having a marking thereon formed from a material according to any of claims 22 to 28.

30. A decal or transfer comprising a carrier sheet, an image layer incorporating a marking in a decorating

medium incorporating a vitrifiable material which fluoresces under ultra-violet light, and a support layer releasable from said carrier sheet with said image layer attached thereto to enable the image layer to be transferred to the surface of an article and attached thereto by firing.

31. A decal or transfer according to claim 30 wherein said design layer is applied between said carrier sheet and said support layer.

32. A decal or transfer according to claim 30 wherein said design layer is applied over said support layer.

33. A decal or transfer according to any of claims 30 to 32 which incorporates additional layers.

34. A decal or transfer according to any of claims 30 to 33 wherein said decorating medium is a vitrifiable decorating material according to any of claims 22 to 28.

35. A decal or transfer substantially as hereinbefore described with reference to Fig. 1 and Figs. 3A to 3C or Fig. 4 or Fig. 5 or Fig. 6 of the accompanying drawings.

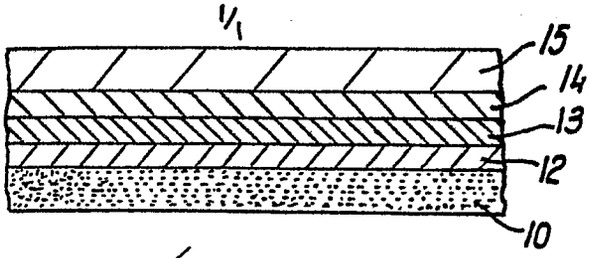
36. An article decorated by means of a decal or transfer according to any of claims 30 to 35.

37. A tamper resistant backstamp for an article of

ware at least one zone of the backstamp having areas printed in a material which fluoresces when subjected to ultra-violet light, whereby following authorized removal of such zone unauthorized replacement of the removed material is detectable by the absence of the fluorescent areas.

38. A backstamp according to claim 37 incorporated in a decal or transfer according to any of claims 30 to 34.

39. An article having applied thereto a backstamp according to claim 38.



ФИГ.1

ФИГ.2



ФИГ.3А

ФИГ.3В 1234567890

ФИГ.3С

ФИГ.4





ФИГ.5

ФИГ.6



0202902

European Patent Office

EUROPEAN SEARCH REPORT

Application number

EP 86 30 3781

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 4)
A	DE-A-2 047 319 (H.C. INDUSTRIES INC.) * Claims 1,7,9,11,12; page 9, paragraph 2; figures 1-5 *	1,13-17	G 09 F 3/00 B 41 M 3/06 B 41 M 3/12
A	GB-A-2 055 694 (AMERICAN OPTICAL CORP.) * Claim 1; page 4, lines 9-28; page 5, lines 40-45 *	1,2	
A	US-A-3 898 362 (COMMERCIAL DECAL INC.) * Claims 1-4; column 4, line 23 - column 5, line 51 *	30-34	
A	BE-A- 652 197 (R.LENGLEZ) * Whole page 1 *	30	

TECHNICAL FIELDS SEARCHED (Int. Cl.4)
G 09 F B 41 M B 44 C

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	21-08-1986	FRANSEN L.J.L.

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
Y : particularly relevant if combined with another document of the same category
A : technological background
O : non-written disclosure
P : intermediate document

T : theory or principle underlying the invention
E : earlier patent document, but published on, or after the filing date
D : document cited in the application
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