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(54) Method and apparatus for forming a color pattern on the surface of an apparel accessory item using a laser beam

(57) A method of forming a two colour pattern, such as a logo, text or a symbol, on a zip fastener slider. The slider is coated with a first layer 201 of acrylic spray paint of a first colour. A second layer 202 of acrylic spray paint of a different colour is then applied on top of the first layer 201. The slider is then placed under a laser head 205, and the pattern is marked out onto the top paint layer 202. The power and speed of the laser head is controlled to remove only the top paint layer 202, so that the bottom layer 201 becomes visible underneath. Since the marking is a heated process, it produces a sealed edge 208 which gives the pattern durability during washing and dry cleaning.

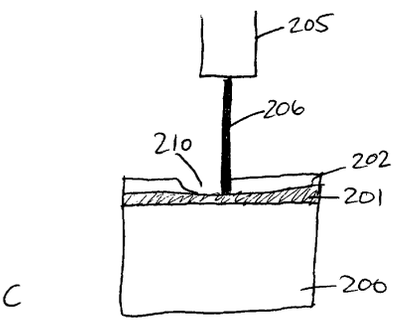

FIGURE 2

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Description

[0001] The present invention relates to apparel accessory items, particularly zip fastener sliders, and in particular, to a method for making a multicoloured pattern on such items.

[0002] Customers often require a logo on the pullers or body of a slider. Such logos may simply be painted on. However, painting by hand is a slow and expensive process, unsuitable for industrial scale production. Painting by machine is difficult for such a small, irregularly shaped item as a slider body. A printing pad cannot reach into corners or grooves in the surface.

[0003] JP-4-74567 discloses a method of forming a design of two or more colours on an apparel accessory item, such as a zip fastener slider, earrings, etc, using differently coloured metallic films. A first metallic layer is deposited onto the substrate by electroplating or the like. A masking layer is then deposited on top. A laser is then used to inscribe a pattern in the masking layer. A laser beam can reach into corners, or to the bottom of pits or hollows, and use of a small spot size allows high precision marking. Either a high power laser may be used to completely remove areas of the masking layer, or a low power laser may be used to harden areas of the masking layer, and the non-hardened area removed by washing. Once the appropriate gaps have been formed in the mask, a second metallic layer is deposited on top of the unmasked parts of the first layer, giving a multicoloured effect. The process can be extended to three or more colours by depositing and etching additional masking layers, and depositing additional coloured metal layers. However, it involves a series of complicated steps for each additional colour to be used, and it is limited to metallic layers and hence a limited range of metallic colours.

[0004] The present invention provides a method of making a pattern of more than one colour on the surface of an article, by applying a layer of colouring of contrasting colour to at least a part of the article, and using a laser to remove an area of the layer of colouring.

[0005] Preferably, the layer of colouring is a layer of paint. A pattern may comprise a logo, text, or some other design. Preferably, two or more layers of paint are deposited, each with a different colour, and the laser removed an area of the upper layer or layers to produce a region where the colour of one of the lower layers can be seen.

[0006] No intermediate masking layers are necessary. The paint layers are deposited, and the appropriate area is directly removed from the top layer to allow the layer below to show through. This method allows for two or more colours to be used to give a colour logo.

[0007] A slider may be sprayed with one colour as a base coat and then a second colour is used to cover the base coat. Standard paints may be used, for example, a waterproof paint such as an enamel paint. The preferred paint type is acrylic spray paint. This is used for all the layers of paint - only the colour of the paint is changed.

[0008] The slider is then placed under a laser head and the logo, text or symbol is marked out on the top coat. By controlling the power and speed of the laser head, the top colour coat is removed and the bottom colour becomes visible. This gives a permanent colour contrast. Depth of cut is achieved by varying the laser power with respect to the speed across the object and this allows the fine cutting of thin layers to be achieved. The laser beam may also eat slightly into the layer beneath, although preferably this is very limited.

[0009] An example of a suitable laser arrangement is a CO2 laser running at approximately 10 watts laser power output at marking speeds of 3000 mm per second. The speed is measured as the speed in a straight single line. A logo text can be produced by the laser machine in approximately 1 second per piece depending on the amount of detail contained within the logo. The required laser power varies slightly from colour to colour, and may be arrived at by initially setting the power and speed at a trial level, then by fine tuning as necessary. The power level and speed which is needed for a particular colour is repeatable (for paint coatings of similar thickness), so once the settings for that colour have been determined, these settings may be re-used later to remove the colour.

[0010] It is possible to produce the logo by manual control of the position of the slider below the laser beam. However, an automated process is more desirable. The logo may be produced with a computer graphics package, and the movement of the laser relative to the slider controlled by a computer. In an alternative form, the slider may be exposed to the laser through a mask, the laser being swept relative to the mask. There is no additional material added after marking.

[0011] It is preferable for the laser beam to be perpendicular to the object's surface during marking. As the laser angle changes, the marking accuracy can be affected, especially when detailed etching is required. The incident angle of the laser beam on the object to be marked may be controlled by directing the beam via one or more mirrors, and adjusting the angle of the mirrors to control the beam direction. This allows edges and irregularities on the object's surface to be marked accurately, as well as its top surface.

[0012] The area over which the laser beam remains in focus is dependent on the focusing lens on the output of the laser. A focus field of 110 mm x 110 mm is suitable for the marking of zip fastener sliders. Preferably, the object to be marked is held close to the focal point of the beam.

[0013] This method of removing layers with a laser can be applied to multi-layers where two, three or four colour layers are used giving a multicolour effect. To set the process up, the necessary laser power and scanning speed settings are found for each individual part of the pattern, so that the desired colour will be achieved. The

laser beam is then scanned across the surface in a single scan, while laser power and speed are adjusted in order to control the number of layers removed at any point. Alternatively, layers could be removed one at a time in separate scans. For example, in a three layered pattern with a top red layer, a middle green layer, and a bottom blue layer, the blue layer may be exposed in two steps - by firstly removing the red layer, then by removing the green layer.

[0014] Other items which may be marked by this method include earrings, pendants, watches, buckles, etc. As well as decorative function, the method could be used in security marking e.g. to apply a unique code to the zip fasteners of luggage, etc. This could either be done with standard paints or using paint which changes colour under ultra violet light.

[0015] The method of the invention is not limited to removing a paint layer to expose another paint layer, but could also be used to remove a paint layer and expose a metal or plastic substrate. Although the sealing process between a paint layer and substrate may not be as good as the sealing between two paint layers, this would only become apparent after a washing cycle if the water got underneath the paint layer and lifted this layer.

[0016] The method also allows for the laser etching of electroplated metals, for example, using a Nd:Yag laser. This type of laser has a very small focal point, and generates a higher power. The beam wavelength is varied to vary the power.

[0017] A preferred embodiment of the invention will now be described with reference to the following drawings, in which:

Figures 1A-1D show a marking process according to the prior art: Figure 1A shows a substrate with a single metallic layer; Figure 1B shows a masking layer deposited on top of the metallic layer; Figure 1C shows an area etched from the masking layer, and Figure 1D shows the etched area having a second metallic layer deposited onto it.

Figures 2A-2D show the steps of a marking process according to a preferred embodiment of the present invention; Figure 2A shows a cross section of the substrate, with a first layer of paint; Figure 2B shows a second layer of paint of a different colour, on top of the first layer of paint; Figure 2C shows a laser removing part of the top layer of paint to form a pattern, and in figure 2D, the marking is complete, giving a two colour pattern.

Figure 3 shows a two colour slider, made according to the method of the present invention.

Figure 4 shows a laser head being used to mark a slider according to the present invention.

Figures 5A - 5D show a series of examples of colour patterns marked onto zip fastener sliders by the method of the present invention. Figures 5A, 5B and 5C are two colour patterns, and figure 5D is a three colour pattern.

[0018] Figures 1A to 1D illustrate a prior art method for forming patterns on a zip fastener slider or other apparel item. Figure 1A shows a substrate 10 of zinc or copper with a first coating 11 of nickel deposited on top by electroplating. The colour depends on the type of metal used, e.g. silver nickel, silver, brass, gold, black nickel, copper.

[0019] Figure 1B shows a masking layer 12 applied on top of the first metallic coating 11. The masking layer 12 may be a polyurethane-based or acrylic based resin, or a photosensitive resin such as epoxy and polyester resins. An area of the masking layer 12 may be hardened by exposure to a low power laser, then the non-hardened area removed by washing to leave a pattern. Alternatively, the pattern may be formed by removing an area of the cured mask outright by exposure to a high power laser. Figure 1C shows the masking layer 12 with a portion removed. A second metallic coating 13 of a different colour to the first is then applied to the mask free region 14, on top of the first coating 11, thus providing a two-colour pattern.

[0020] Figures 2A-2D show a process to make a two coloured article, according to a preferred embodiment of the present invention. Figure 2A shows a cross section of a substrate 200 with a first paint layer 201. The substrate 200 is preferably a zip fastener slider body or puller, which may be of metal or plastics. The paint layer 201 is preferably a layer of acrylic, enamel spray paint, but other paints may be used..

[0021] Figure 2B shows a second paint layer 202 on top of the first paint layer 201. The second paint layer 202 is of a different colour from the first paint layer, and is preferably of the same paint type.

[0022] Figure 2C shows a laser beam 206 from a laser unit 205 removing part of the second paint layer 202. The power of the laser and the speed at which it moves across the surface are adjusted so that the region of the second layer 202 which had been exposed to the beam 205 is completely removed, but the underlying layer is left substantially in tact. This forms a gap 210 in the second layer 202, so that the first layer 201 is visible, thereby creating a two colour pattern. Figure 2D shows the finished article, with a background colour provided by the second layer 202, and a pattern in the colour of the first layer 201.

[0023] It has been found that a pattern formed in this way has good durability, wear and wash resistance. Without wishing to be bound by theory, it is believed that as the gaps 210 are removed from the top layer 202, the surrounding edge of the area is heated and melted slightly. This results in the edges 208 of the second layer 202 forming a seal against the first layer 201, which provides durability, and eliminates the need for any further

protective coating.

[0024] Figure 3 shows the flat underside of a two colour slider body 280, made according to the method of the present invention. In this slider body 280, a large regions of the outermost or top paint coat 202 has been removed to show the bottom paint coat 201, giving a two tone effect. A logo 260 has additionally been produced by removing a further part from the remaining area of the top layer 202.

[0025] On the slider body 280, not only has the major surface been patterned, but also the side 252. This can be done in the same manner as marking the top, by manipulating the laser beam.

[0026] Figure 4 shows a beam 206 from a laser 205 being used to mark a slider 280 according to the present invention. The laser 205 is preferably a CO2 laser with a power of 10W, and the depth of cut into the paint can be controlled by the speed at which the beam is scanned across the surface of the slider 280.

[0027] Figures 5A and 5B show examples of two colour patterns marked on standard zip fastener sliders by the method of the present invention. Text 261, a logo or another pattern or background design may be produced. Figure 5C shows a marked slider with a disc shaped puller. Figure 5D shows a three coloured pattern.

[0028] It is not necessary to treat the slider body and puller separately. A pattern can be formed on the two parts while they are joined together, ensuring that the pattern overlays the two parts evenly.

[0029] The invention can be applied to other items, and is particularly suited to notions, such as low cost apparel items, including buckles, clasps, hooks, etc for garments, bags and the like, having complex shapes which can be spray or dip painted and then a pattern etched in a paint layer by means of a laser beam. The invention may also be applied to laminated plastics material, one or more of the exposed layers being etched with the laser to reveal the underlying layer.

Claims

1. A method of making a pattern of more than one colour on the surface of an article, by:

   applying a layer of colouring of contrasting colour to at least a part of the article, and
   using a laser to remove an area of the layer of colouring.

2. A method as claimed in claim 1, wherein the layer of colouring is a paint layer.

3. A method as claimed in claim 2, wherein two overlapping paint layers are applied, each layer having a different colour, and a pattern is formed by removing part of the uppermost layer.

4. A method as claimed in claim 3, wherein a part of both layers is removed.

5. A method as claimed in claim 2, wherein a plurality of overlapping paint layers are applied to at least a part of the article, each paint layer having a different colour than the other paint layers, and wherein the laser is used to remove at least one chosen area of the paint to a chosen depth, such that at least part of the uppermost paint layer is removed.

6. A method as claimed in claim 5, wherein the number of paint layers is two.

7. A method as claimed in claim 5, wherein the number of paint layers is three.

8. A method, as claimed in any one of claims 3 to 7, wherein the laser fuses the edge defining the area which is removed to the underlying layer.

9. A method as claimed in any one of claims 1 to 8, wherein the power of the laser and/or the amount of time for which the laser beam is incident on a paint layer is controlled to control the depth of paint removed by the laser at a chosen area

10. A method, as claimed in any one of the preceding claims, wherein the laser is a CO_2 laser, running at a 10W power level.

11. A method, as claimed in any one of the preceding claims, wherein the article is an apparel accessory item.

12. A method, as claimed in any one of the preceding claims, wherein the article is a zip fastener slider.

13. A method of making a pattern on a substrate, comprising the steps of:

    forming a first paint layer of one predetermined colour on the substrate;
    forming a second paint layer of a second predetermined colour on top of the first paint layer;
    exposing said second paint layer to a laser beam to remove part thereof and uncover a portion of said first paint layer.

14. A notion comprising a substrate, a first paint layer of one colour, and a second paint layer of another colour on top of said first layer, comprising at least one gap in the second layer, through which the colour of the first layer shows, **characterised in that** at the edges of said gap, the second layer has been fused against the first layer.

15. A machine for marking a pattern in a covering of

paint, the paint varying in colour with depth through the covering, the machine comprising a laser, and means to control the motion of the laser relative to the covering of paint to remove the paint to a predetermined depth.

16. A method of producing a pattern on the surface of an article, by applying a layer of paint, and selectively removing chosen regions of the layer with a laser beam such that the area below the area of paint shows, giving a colour contrast with the layer of paint.

17. A method of making a pattern of more than one colour on the surface of an article, by:

applying a covering of paint to at least a part of the article, wherein the paint colour varies with depth through the thickness of the covering; and
using a laser to remove at least one chosen area of the paint to a chosen depth, thus exposing a colour different from the surface colour of the paint covering,

wherein said chosen depth is less than the thickness of the covering at the chosen area.

FIG. 1A

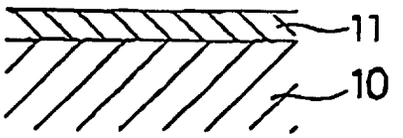


FIG. 1B

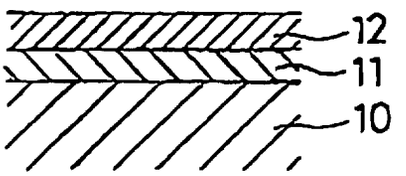


FIG. 1C

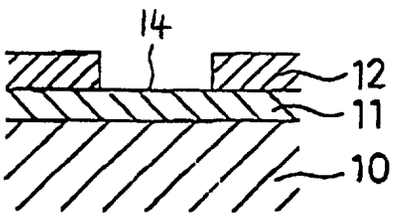
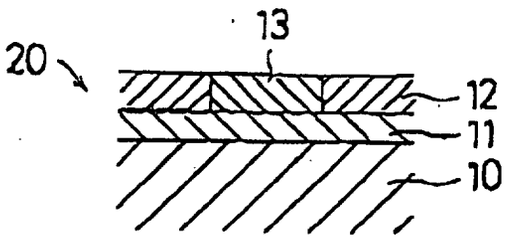
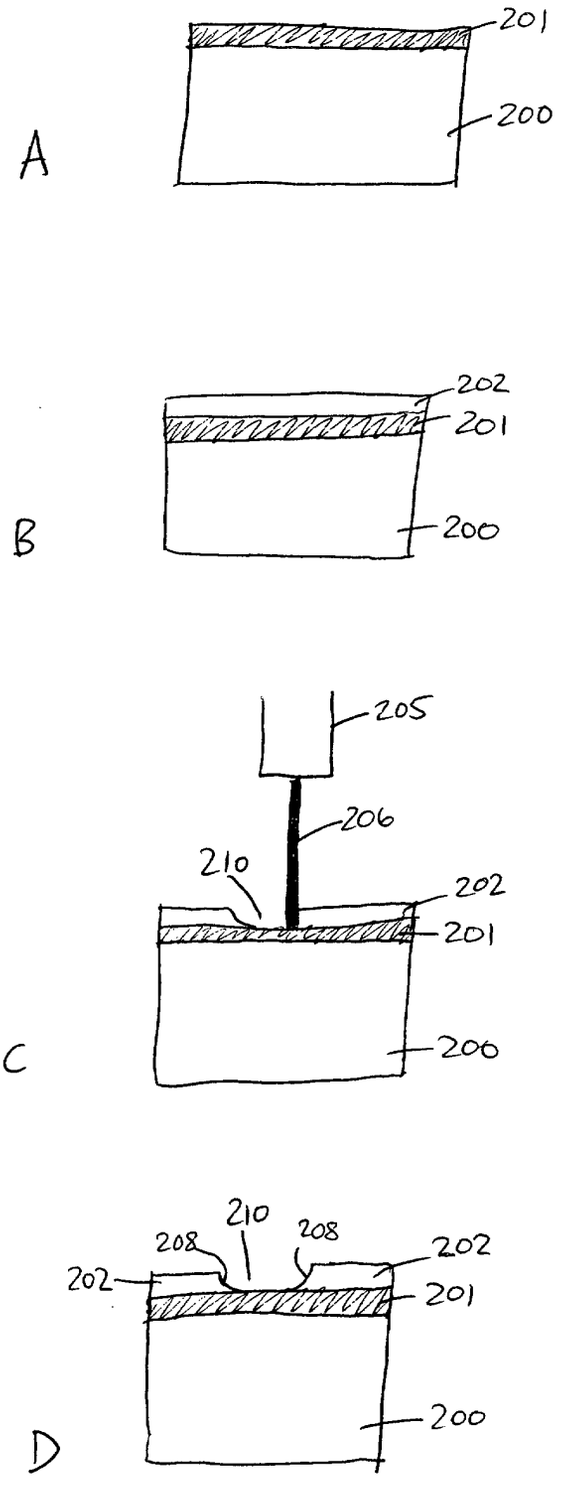


FIG. 1D




A
201
200
B
202
201
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C
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206
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D
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FIGURE 2

FIGURE 3

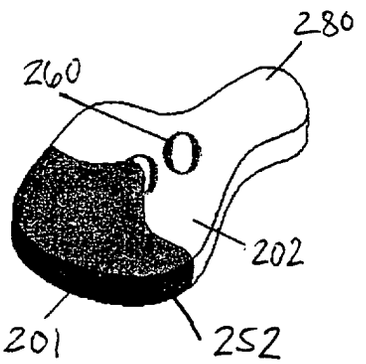


FIGURE 4

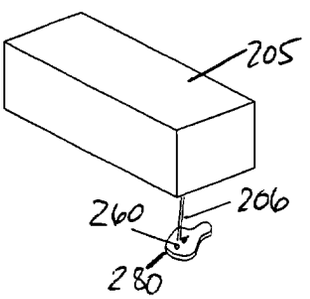
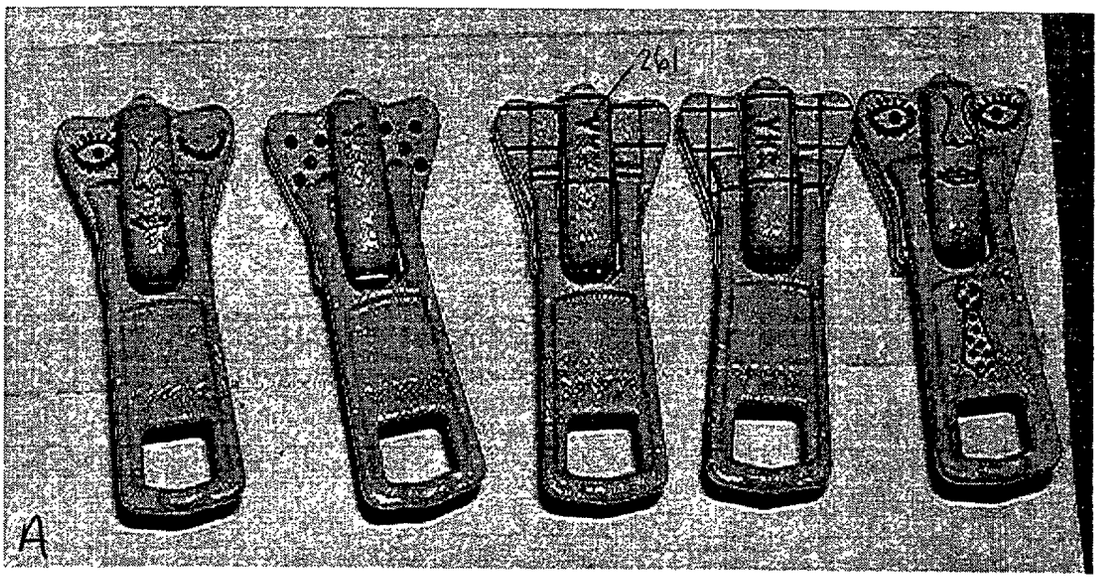
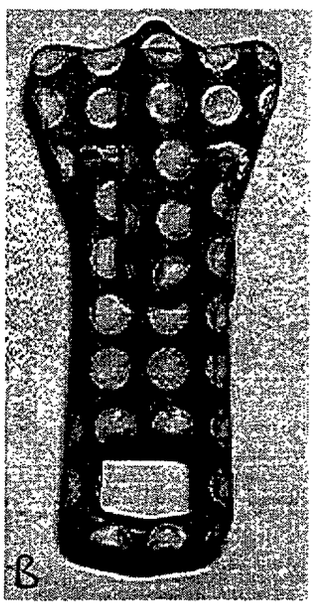
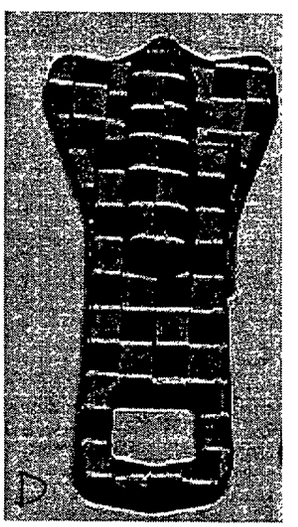


FIGURE 5







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EUROPEAN SEARCH REPORT

Application Number
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The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
MUNICH	27 November 2001	Cuiper, R

CATEGORY OF CITED DOCUMENTS

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