Title: METHOD FOR MANUFACTURING A HOUSEHOLD APPLIANCE COMPONENT WITH A SPECIFIC COLOURING AS WELL AS A HOUSEHOLD APPLIANCE COMPONENT

Abstract: The invention relates to a method for manufacturing a household appliance component (2, 3), in which a metallic surface (4) is provided with a first colour and the surface (4) is structured, wherein the surface (4) for structuring is moistened with a liquid (5) and after having been applied to the surface (4) the liquid (5) is acted upon by a laser beam (7) and thereby a structuring liquid is generated, wherein by structuring liquid the surface (4) is structured in such a way that the colouring of the surface (4) is changed from the first into a second colour that is different therefrom.
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Method for Manufacturing a Household Appliance Component with a Specific Colouring as well as a Household Appliance Component

The invention relates to a method for manufacturing a household appliance component, in which a metallic surface with a first colour is provided and the surface is structured. Moreover, the invention also relates to a household appliance device.

In household appliances facia panels or housing elements are known to be designed with individual colouring. In this connection plastic parts are known that are designed as injection moulded components and thereby are generated already with corresponding colouring.

Moreover, it is also known that metal parts are provided that then are individually coated or imprinted or otherwise processed so that they have an individual colouring.

In this connection it is also known that precisely such metal parts are processed by means of a laser beam exerting a direct effect and thereby also at least locally a change in colour occurs individually, which then is also desired in this connection. In particular in this connection colourings that appear metallic, for instance blue or green or yellow or black, can be generated. However, in this connection the range of different colourings in a direct laser processing of the metallic part is also limited.

It is the task of the present invention to provide a method for manufacturing a household appliance component as well as a household appliance component, with which or in which without an additional application of a colour layer an individual colouring can be designed.

This task is solved by a method and a household appliance component according to the independent claims.

In a method for manufacturing a household appliance component according to the invention the household appliance component or at least a basic component thereof is provided with a metallic surface. The surface is manufactured with a first colour and thus
then also provided. The surface is structured. An essential idea of the invention is to be seen in that the surface is moistened for structuring and it is acted upon the liquid by means of a laser beam once it has been applied to the surface and thereby a structuring liquid is generated. By the structuring liquid the metallic surface is structured in such a way that the colouring of the surface is changed from the first colour into a second colour that is different therefrom. By the invention a very specific method employing a laser and a liquid is performed, in order to create an individual colouring of the surface. It is thus no longer required to apply an additional colour layer upon this metallic surface, in order to generate the desired final colouring. By this way of proceeding according to the invention, with the laser beam acting upon the applied liquid and changing this liquid then specifically to the effect that in the amended state, that is then characterized by the structuring liquid, it then structures the surface itself, an colour changing option of a household appliance component during the manufacturing process is improved or expanded. By generating this structuring liquid thus a medium in this manufacturing process is temporarily generated, which supports the change in colouring and thus the change from the first colour into the second colour at least essentially. This is a particularly advantageous way of proceeding, since the metallic surface thus also is not structured in an undesired way and the change of colouring is achieved in a particularly precise way. The appearance of this second colour moreover by this way of proceeding according to the invention can be generated in a very high-contrast and homogenous way so that the second colour is also perceived as very uniform.

Preferably the liquid is heated by the laser beam in such a way that a structuring liquid comprising vapour bubbles is formed. By the then occurring bursting of the vapour bubbles the metallic surface is structured in such a way that the surface appears optically effective with the second colour.

In a particularly advantageous way the colouring of the metallic surface is generated with the second colour appearing white. The very generating of surfaces appearing white is a particular challenge. Since this colouring in the field of household appliances, however, is very comprehensively and predominantly given, this very colouring is preferably facilitated by the method according to the invention. As has already been set out initially, such a colouring of a metallic surface appearing white up to date is not possible even when using
a laser beam, since with a direct effect of the laser beam exerted upon the metallic surface up to date only other colouring than white can be generated.

The relatively strong change in the surface topography rendering the characteristic white colour is caused by the erosion of the metal substrate, if a main part of the liquid is heated and thereby the structuring liquid formed. If this liquid evaporates through the effect of the laser, vapour bubbles are generated. These vapour bubbles expand and collaborate then as a consequence of the increase of a local pressure in the vicinity of the boundary layer between the structuring liquid and the metallic surface. This cavitation process and thus the formation and disintegration of vapour bubbles affects the microhydrodynamic of this area of the liquid and several dynamic jet flows, which hit the surface and have corresponding energy to change the surface.

Thereby a structuring is generated that corresponds to an irregular high distribution of craters, in particular similarly shaped structural spots, which then reflect and/or control the incident light in such a way that this reflection of the incident light occurs chaotically. From this in a very homogenous and clear representation a mat white results as second colour, which even then correspondingly persists and appears as corresponding colour, if the incident light enters at the most different random angles upon the then structured metallic surface.

Generally it is also needs to be pointed out that the liquid merely is a manufacturing medium, which is present in the manufacturing method, however, after the structuring is no longer present and thus the structured surface is provided without this structuring liquid.

In an advantageous way the surface is then entirely formed and provided from a metallic material. The household appliance component, in particular a basic component of this household appliance component provided for changing the colouring in this connection is preferably entirely made from metal.

Preferably, the metallic surface is designed to be made of stainless steel.
In one embodiment it is envisaged that the liquid is applied upon the surface to be static and thus quasi no relative movement occurs between the liquid as a whole and the surface, whilst the laser beam is acting upon it.

However, it may also be envisaged that the liquid is moved relative to the surface, in particular flows on the surface in one direction, when the laser beam acts upon the liquid, in order to then generate therefrom in particular the structure liquid.

Depending on the situation thus variably the liquid can be generated to be either static or dynamic relative to the surface.

In an advantageous way the liquid is provided as an incombustible liquid. In particular it is envisaged that as a liquid distilled water or a glass cleaner or an oil is provided.

In an advantageous way the laser beam is generated with a wavelength in the infrared light range and correspondingly acts upon the liquid.

It may be envisaged that depending on the kind of liquid and/or the thickness of the liquid on the surface the laser beam also at least partly passes through the liquid and directly acts upon the surface.

With regard to the structuring as to the changing of the colouring of the surface the most varied pairs of the liquid and the metallic material of the surface as well as the laser parameter may be envisaged. Preferably, it is envisaged that the higher the correspondence between the solid body of the surface and the liquid the more the substrate and thus the surface is moistened and the smaller can be the thickness of the liquid laser. The smaller the area of the liquid that is heated by the laser beam, the fewer vapour bubbles are generated. Thereby the structuring then will be less and the intensity of the appearance of the second colour, in particular the white colouring reduced.

Moreover it is envisaged that the higher the viscosity of the liquid the higher is also the hydrodynamic resistance and thus also the energy flux generated by the bursting of the vapour bubbles. From this, in turn, results a lower structuring rate of the surface and an involved lower appearance of the second colour. Moreover, a further influence quantity is
the boiling point of the liquid. The higher this boiling point, the faster the liquid disappears due to evaporation. Moreover, it is to be generally noted that the lower the energy density of the laser beam acting upon the liquid the more slowly the heating and in particular the boiling of the liquid is achieved and the more slowly the collapsing process of the vapour bubbles occurs, which again leads to a slowed down erosion mechanism and thus a slower structuring of the surface.

Preferably, thus depending on the liquid and its parameters with regard to the composition and the thickness and/or with regard to the laser parameter and/or with regard to the metal of the surface an individual structuring can be achieved. A more intense colouring is achieved, the larger the number of the generated vapour bubbles that then burst between the liquid and the surface and then act upon the surface by the generated jet flows and structure these.

Preferably, a facia panel or a housing part is generated as household appliance component.

Moreover, the invention also relates to a household appliance component, which is manufactured according to a method according to the invention or an advantageous embodiment thereof.

In the following embodiments of the invention are explained in more detail by referring to schematic drawings. These show in:

Fig. 1 a schematic representation of subcomponents of a device for manufacturing a household appliance component; and

Fig. 2 a schematic representation of subcomponents of a further embodiment of a device for manufacturing a household appliance component.

In the figures same elements or elements having the same function are equipped with same reference signs.
In Fig. 1 a schematic representation of a device 1 is shown, which is configured to manufacture a household appliance component. A household appliance component 2 is shown in the partial sectional view. The household appliance component 2, which then manufactured in the completed state for instance may be a facia panel or a housing component, comprises a basic component 3, which at least in portions, is made in particular completely from metal, preferably precious metal. However, equally a different metal may be envisaged. This basic component 3 at least on one surface 4 comprises a first colour. This means that to a viewer this basic component 3 on the surface 4 appears in a first colour and thus is optically perceived correspondingly with the first colour. In order to form at least this surface 4 in partial areas with a different colouring and thus to then permanently provide it finally with this second colouring, a processing liquid of a liquid 5 that is auxiliarily employed for the manufacturing of a structuring is applied at least in portions on the surface. The liquid 5 thus is applied at least in the partial areas of the surface 4 that are to be changed as to their colouring from a first colour into a second colour.

The liquid 5 in the embodiment shown in Fig. 1 is applied to be static, which means that no relative movement between the area of the liquid 5 as a whole and the basic part 3 occurs.

The device 1 moreover comprises a laser 6, which is an infrared laser and thus comprises a laser beam 7 with a wavelength in the infrared range. This laser beam 7 is directed at the liquid 5 so that it acts upon same correspondingly. This liquid 5, which is an incombustible liquid and for instance distilled water or oil or a pane cleaning agent, is heated by a laser beam 7.

By this heating a structuring liquid is generated that is characterized to the effect that by the heating vapour bubbles are formed that expand and then burst. By the vapour bubbles generated in the border area between the liquid 5 and the surface 4 then dynamic jet flows or energy flows are generated, which hit the surface 4 and by way of acting upon the surface 4 structure it accordingly. Through this structuring an optical appearance is generated, which makes the second colour appear, which is a white colour.
Thus, this means that also a metallic basic part 3 is generated without the application of an additional colour layer upon the surface 4 with a surface appearing white.

Fig. 2 shows an alternative embodiment. In contrast to Fig. 1 it is envisaged here that the liquid 5 is moved relative to the surface 4 and same flows on the surface 4 in one direction.

In both embodiments it is envisaged that the liquid 5 is applied directly to the surface and moistens or wets it.
LIST OF REFERENCES

1 device
2 household appliance component
3 basic component
4 surface
5 liquid
6 laser
7 laser beam
CLAIMS

1. A method for manufacturing a household appliance component (2, 3), in which a metallic surface (4) with a first colour is provided and the surface (4) is structured, characterized in that the surface (4) for structuring is moistened with a liquid (5) and after having been applied to the surface (4) the liquid (5) is acted upon by a laser beam (7) and thereby a structuring liquid is generated, wherein by the structuring liquid the surface (4) is structured in such a way that the colouring of the surface (4) is changed from the first colour into a second colour that is different therefrom.

2. The method according to claim 1, characterized in that the liquid (5) is heated by the laser beam (7) in such a way that a structuring liquid comprising vapour bubbles is formed, and by the bursting of the vapour bubbles the surface (4) is structured in such a way that the surface (4) appears optically effective permanently with the second colour.

3. The method according to claim 1 or 2, characterized in that the colouring of the surface (4) is generated with the second colour appearing white.

4. The method according to any one of the preceding claims, characterized in that the surface (4) is provided entirely made from a metallic material.

5. The method according to any one of the preceding claims, characterized in that the liquid (5) is applied statically on the surface (4).

6. The method according to any one of the preceding claims 1 to 4, characterized in that the liquid (5) is moved relative to the surface (4), in particular flows on the surface (4) in one direction.

7. The method according to any one of the preceding claims, characterized in that as liquid (5) an incombustible liquid is provided.

8. The method according to any one of the preceding claims, characterized in that as liquid (5) distilled water or a glass cleaner or an oil is provided.
9. The method according to any one of the preceding claims, characterized in that the laser beam (7) is generated with a wavelength in the infrared range.

10. The method according to any one of the preceding claims, characterized in that a household appliance component (2, 3) a facia panel or a housing element is generated.

11. A household appliance component (2, 3), which is manufactured according to a method according to any one of the preceding claims.
INTERNATIONAL SEARCH REPORT

A. CLASSIFICATION OF SUBJECT MATTER
B41M5/26 B44C1/22
B41M5/24

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
B41M B44C

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)
EPO-Internal, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

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