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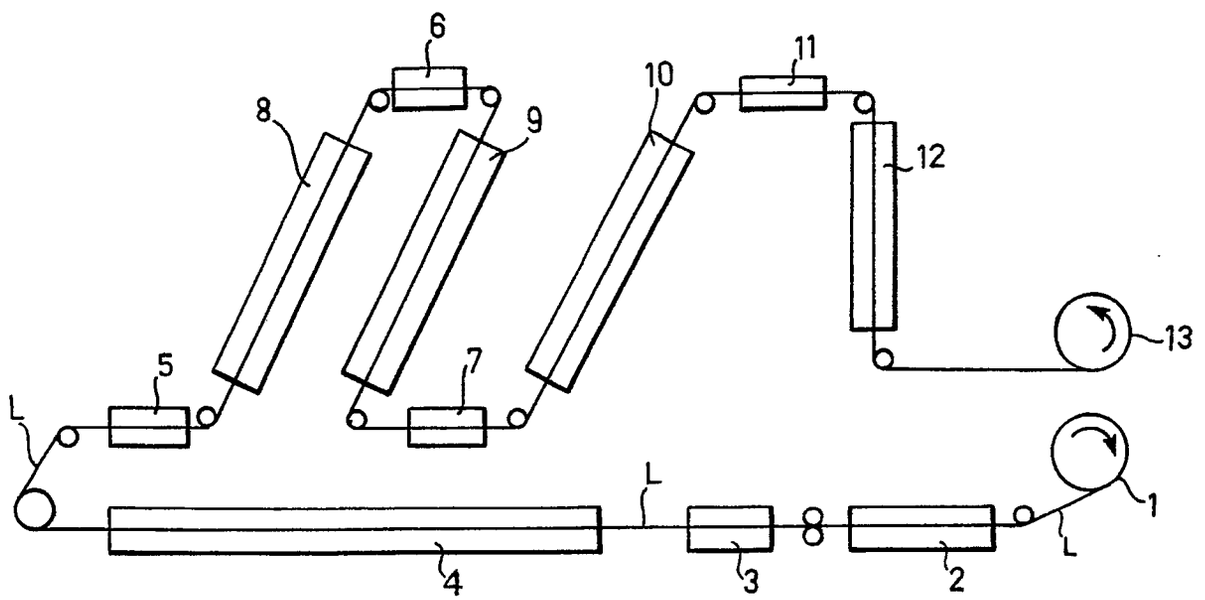
(54) A method of manufacturing a painted motor-vehicle body.

(57) The method of manufacturing a painted motor-vehicle body comprising drawn sheet-metal components, comprises the steps of prepainting the sheet metal with at least one anchoring coat (primer) and at least one covering paint coat, drawing the prepainted sheet metal to the desired shapes and assembling the prepainted, drawn components.

To advantage, the sheet metal is prepainted by a continuous process with the application of a polyurethane paint cross-linked by the permeation of a vaporised amine which can cause the cross-linking of the paint.



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A METHOD OF MANUFACTURING A PAINTED MOTOR-VEHICLE BODY

The present invention relates to a method of manufacturing motor-vehicle bodies painted with at least one anchoring coat (primer) and one covering paint coat, and comprising drawn sheet-metal components. In the conventional method of manufacturing motor-vehicle bodies, the pieces of sheet metal are deep-drawn to the desired shapes and the drawn components are then assembled. The body thus produced is painted by the application of a primer coat and a covering or base coat, followed by the application of a further, finishing paint coat.

An object of the present invention is to provide a new method of manufacturing a body which is particularly promising and advantageous as regards a reduction in the manufacturing costs.

This object is achieved by means of a method of the type mentioned above, characterised in that it includes the steps of:

- prepainting metal in sheet form with the primer coat and the covering coat, drawing the prepainted sheet metal to the desired shape, and
- assembling the drawn components.

It has been found that the deep-drawing of prepainted pieces of sheet metal provides many advantages over the prior art. In particular, it is not necessary to apply a lubricant to the metal sheet before drawing. Moreover, the sheet metal prepainted with the polymeric covering coat shows an improved behaviour in respect of creeping during the drawing operation so that the thickness of the sheet metal can be reduced or, alternatively, poorer-quality sheet metal can be used for a given drawing depth.

Typically, in the method according to the invention, the primer coat is applied in thicknesses of between 5 and 10 microns, preferably 6-7 microns; in the case of galvanised sheet metal, the primer is typically acrylic.

In view of the subsequent deep-drawing operation, it is advantageous for the covering or base paint coat to be applied to a total thickness of the order of 50-80 microns, which generally requires two or more successive applications of paint. The paint used for the covering coat is preferably of a cross-linkable polyurethane type.

To advantage, in order to industrialise, and make economic, the method of prepainting strips of sheet metal wound in rolls for use in the automotive sector by the application of the method described above, the polyurethane paint is cross-linked by the "vapour permeation curing" technique.

A further subject of the invention is therefore constituted by a method of painting strips of sheet metal wound in rolls, in which the sheet-metal strip is supplied continuously to one or more paint baths for the application of one or more covering coats of cross-linkable polyurethane paint, characterised in that each covering coat is cross-linked by the continuous supply of the strip output from each paint bath to an environment saturated with a vaporised amine, preferably a tertiary aliphatic amine, which can cause the polyurethane paint to cross link at a temperature of generally between 60 and 80° C.

Further characteristics and advantages of the invention will become clear from the detailed description which follows with reference to the appended drawing which shows, purely by way of non-limiting example the layout of a plant for prepainting metal sheets intended for subsequent drawing operations.

With reference to the drawing, a strip of sheet metal L is supplied continuously from an unwinding reel 1 to a preliminary degreasing stage 2 and then to a painting stage 3 for the application of a coat of primer, generally constituted by an acrylic resin, from 5 to 10 microns thick. The coat of primer, applied to both sides of the sheet metal, is then dried by conventional methods in an oven 4; since the primer coat is quite thin, the drying times are quite short in this stage.

From the drying oven, the strip L is supplied continuously to one or more painting stages 5, 6, 7 for the application of a covering coat of polyurethane resin. At the output of each painting stage, the polyurethane paint coat is cross-linked in stages 8, 9 and 10 by the "vapour permeation curing" technique (VPC). The VPC technique is known and is described, for example, in U.S. Patent No. 4,396,647, but is not used for the continuous painting of sheet metal. In this technique, the polyurethane paints contain a blocked catalyst which is activated to cause the cross-linking of the resin following its permeation by an amine vapour, preferably a tertiary aliphatic amine. The stages 8, 9 and 10 shown in the drawing are each constituted by a vacuum chamber, either vertical or inclined, in which an aliphatic amine vapour is brought into contact with the painted surface causing it to dry quickly at quite low temperatures, generally between 60 and 80° C. The chambers 8, 9 and 10 are operated under vacuum in order to prevent the amine vapour from escaping and may be provided with interspaces for preventing the entry of dust which would damage the surfaces of the sheet metal .

The method of painting with VPC cross-linking enables several coats of paint to be applied within a single sheet-handling operation with advantages

as regards painting costs. This method is particularly advantageous for the prepainting of sheet metal for drawing since the thickness of the coating layer required makes several passes necessary for its deposition. The periods of time spent in the VPC chamber are of the order of 10-15 minutes and are much shorter than the periods necessary for conventional, thermal cross-linking. Moreover, with the use of this method, the successive paint coats can be deposited without the need to wait for each individual coat to dry completely. Moreover, the polyurethane paints used in the method have a greater polymerisation density.

The sheet metal output from stage 10 may then be supplied to a stage 11 for the deposition of a lubricant. The application of a lubricant is not, however, strictly necessary for the subsequent drawing. The sheet metal output from stage 11 may be subjected to a final drying stage in an oven 12 and is then rewound into rolls 13.

Within the scope of the method of manufacturing a motor-vehicle body, the pre-painted sheet-metal strip is then deep-drawn to produce components of the desired shapes.

The drawn and prepainted components are then assembled. The prepainted and drawn components can be connected permanently to each other or to other parts of the motor-vehicle body by welding and gluing.

The conventional spot-welding of prepainted sheet metal involves operative problems since the presence of the polymeric coating film, which has insulating properties, prevents the passage of current. It is therefore necessary first to remove the coating from the contact surfaces to be interconnected. The coat can be removed mechanically by milling or, conveniently, by the application of a concentrated heat load by means of a laser beam to cause the sublimation of the paint layer from a limited area little larger than that necessary for the spot weld.

The method of assembling prepainted components, which is the subject of the invention, also enables painted bodies to be produced with a predetermined, decorative, ornamental pattern, which cannot be achieved industrially by the conventional method of assembly. For this purpose, in one embodiment of the invention, prepainted metal sheets are used which carry an ornamental pattern applied to the sheet metal itself by a transfer technique. In this embodiment, an ornamental pattern is applied, with heat and by a transfer technique, to the sheet metal strip which has already been coated with a primer and at least one first covering paint, with the use of a transfer film or sheet such as that described, for example, in Italian Patent Application No. 53445-B/87.

When an ornamental pattern is to be applied, the sheet metal is preferably painted with a primer coat, a coat of polyamide paint about 30 to about 50 microns thick and a coat of polyurethane paint between 15 and 25 microns thick. The application of the pattern by the transfer technique does not result in an increase in the thickness of the coating; it is, however, necessary to apply a protective coat of polyester lacquer, about 5-8 microns thick, after the body has been assembled.

Claims

1. A method of manufacturing a body, particularly for a motor vehicle, painted with at least one primer coat and one covering paint coat, and comprising drawn sheet-metal components, characterised in that it comprises the steps of:
   - prepainting the metal in sheet form with the primer coat and the covering coat,
   - drawing the prepainted sheet metal to the desired shapes of the components, and
   - assembling the drawn components.

2. A method according to Claim 1, characterised in that it includes the deposition on the sheet-metal strip of a coat of acrylic primer having a thickness of from 5 to 10 microns and a coat of polyurethane paint having a thickness of from 50 to 80 microns.

3. A method according to Claim 2, in which the sheet-metal strips are painted by the continuous feeding of sheet-metal strip through one or more paint baths in which one or more covering coats of cross-linkable polyurethane paint is applied, each coat being cross-linked by the feeding of the strip output from each paint bath to an environment saturated with a vapourised aliphatic amine.

4. A method according to Claim 1, characterised in that it includes the application to the metal in sheet form, prepainted with the at least one primer coat and at least one covering paint coat, of an ornamental pattern deposited by a transfer technique.

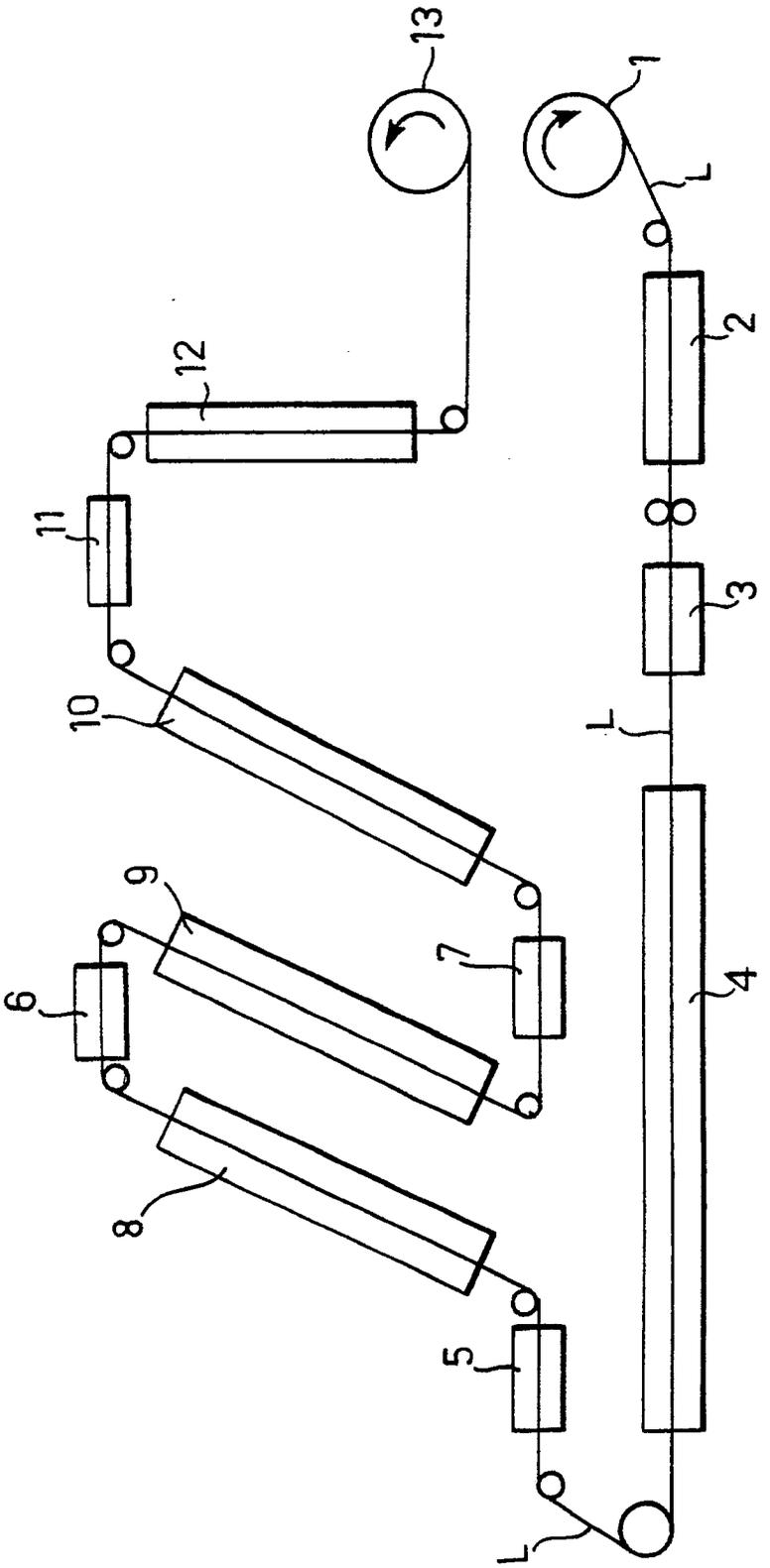
5. A method according to Claim 4, in which the covering paint coat comprises a first polyamide coat having a thickness of from 30 to 50 microns and a polyurethane paint coat having a thickness of from 15 to 25 microns.

6. A method according to any one of Claims 1 to 5, in which the prepainted, drawn components are glued together.

7. A method according to any one of Claims 1 to 5, in which the prepainted, drawn components are spot-welded together after the removal of the paint from the contact regions involved in the welding.

8. A method of painting sheet-metal strips wound in rolls, in which the sheet-metal strip is supplied continuously to one or more paint baths for the application of one or more cross-linkable polyurethane paint coats, characterised in that it includes the step of cross-linking each coat by supplying the strip output from each paint bath to an environment saturated with a vapourised aliphatic amine.

9. A method according to Claim 8, in which the polyurethane coat is cross-linked at a temperature of between 60 and 80 ° C.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EUROPEAN SEARCH REPORT

Application Number

EP 90 12 5419

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)
X Y	US-A-3 891 471 (J.E. SUMMERS et al.) * Claim 1; column 1, line 66 - column 2, line 9 *	1 2	B 05 D 7/14 B 05 D 1/36
Y	US-A-4 659 395 (T. SUGAMA et al.) * Claims 1,17; abstract *	2	
D,A	US-A-4 396 647 (G.L. LINDEN) * Complete document *	3,8	
A	DE-U-8 807 848 (MIROGLIO TESSILE S.p.A.) * Complete document *	4	
X	US-A-4 812 365 (W.T. SAUNDERS et al.) * Claim 1 *	1	
X	US-A-4 720 403 (K.E. JASENOF et al.) * Claims 1,15; column 1, lines 21-43 *	1	
X	FR-A-2 182 987 (ROBERTSON BAUELEMENTE GmbH) * Claims 1,3 *	1	
X	US-A-3 593 848 (A.H. LANDAU) * Claims; abstract *	1	TECHNICAL FIELDS SEARCHED (Int. Cl.5) B 05 D 1/18 B 05 D 1/36 B 05 D 7/14
X	US-A-4 702 968 (K. MASUHARA et al.) * Abstract; example 1 *	1	
X	US-A-4 818 350 (K. BATZAR) * Claim 1; abstract *	1	
X	DE-A-2 200 180 (KABEL- UND METALLWERKE GUTEHOFFNUNGSHÜTTE AG) * Claim 1; page 5 *	1	

The present search report has been drawn up for all claims

Place of search	Date of completion of search	Examiner
The Hague	02 May 91	STROUD J.G.

CATEGORY OF CITED DOCUMENTS

X: particularly relevant if taken alone
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A: technological background
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&: member of the same patent family, corresponding document