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(54) Title: PRESS ELEMENT AND METHOD FOR MANUFACTURING LAMINATE

(57) Abstract: Press element for manufacturing laminate, wherein this press element substantially consists of a basic element having a covering layer at least at the side which is intended for being directed towards the laminate, characterized in that said covering layer has a matrix structure in which mineral or ceramic particles are comprised. The invention further also relates to a method in which such press element is applied.

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Press element and method for manufacturing laminate.

This invention relates to a press element and to a method for manufacturing laminate. More particularly, the invention relates to a press element for manufacturing laminate of any type and to a method for manufacturing any type of laminate.

In particular, the invention relates to a press element, such as a press roller, press belt or press plate, which can be applied when manufacturing so-called DPL (Direct Pressure Laminate), wherein one or more material sheets provided with resin, for example, paper sheets, are brought into a press together with a substrate, for example a wood-based substrate, where, by means of such press element, they are subjected to an increased pressure and temperature and thereby are mutually connected in order to form a coated substrate, which then can be processed further to any coated panel, such as a furniture panel or a floor panel. However, the invention is not restricted to press elements for manufacturing DPL. Such press elements may also be applied for manufacturing other laminate types, such as HPL (High Pressure Laminate), wherein several material sheets provided with resin first are consolidated before they are provided, for example, glued, on a substrate, or such as compact laminate, which substantially consists of such press-treated material sheets, or such as any type of laminate comprising material sheets provided with resin.

In the state of the art, it is known in certain applications, for example, in floor or furniture applications, to provide hard particles in the laminate, with the intention of obtaining a certain wear and/or scratch resistance at the surface of the laminate. The use of these particles is a known cause of wear at the press element used in the manufacture of the respective laminate.

In order to prevent or minimize such wear at the press element, it is known from prior art to provide this press element with a wear-resistant covering layer. Such covering layers form the subject of the patent documents US 5,723,221, EP 1 063 085 and EP 1 417 090. In each of these patent documents, it is aspired to obtain an entire ceramic covering layer of aluminum oxide, metal borides or synthetic diamond, respectively. These layers are hard and may promote the wear

resistance at the surface of the press element, however, still leave a lot to be desired in respect to other features of this covering layer and/or press elements. So, for example, a better heat transfer between the press element and the laminate, an easier release of the press element from the laminate surface and/or less friction between the press element and the laminate are desirable. Moreover, the techniques used in said patent documents for applying such covering layers or coatings are rather complicated and/or cumbersome and/or expensive. They relate to applying the covering layer by cladding and subsequent anodization, applying by means of sputtering, or applying by means of plasma treatment, respectively. Moreover, these techniques, under economical conditions, allow only for limited covering layer thicknesses. The obtained covering layers also are difficult or almost not removable without affecting the press element itself. However, removing the covering layer may be desirable for renewing it, when nevertheless wear is forming on this covering layer. It is noted that such press element, or at least the basic element of such press element, in many cases is provided with a structure or a texture intended for providing the laminate with corresponding impressions during the press treatment. Such structure or texture preferably is not affected when removing the covering layer. Also, this structure or texture of the basic element preferably is maintained as true as possible when providing the covering layer. In the herein-above mentioned techniques, also this true representation leaves much to be desired. Further, these techniques require many time-consuming finishing treatments, such as polishing and/or matting.

The present invention relates to a press element with an alternative covering layer, which moreover may offer a solution for one or more of the herein-above mentioned disadvantages of the prior art. To this aim, the invention relates to a press element for manufacturing laminate, wherein this press element substantially consists of a basic element having a covering layer at least at the side that is intended for being directed towards the laminate, with the characteristic that said covering layer has a matrix structure in which mineral and/or ceramic particles are comprised. Per definition, the "matrix structure" is any structure of any material which can bind the mineral and/or ceramic particles, whether or not directly, in mutual respect and/or whether or not directly, on said basic element. Such matrix structure preferably is built up in one piece of the same material or alloy and/or preferably is situated at least in between the mineral and/or ceramic particles.

To this end, such covering layer has a composite structure, the separate parts or materials of which may be attuned to the desired features of the covering layer or the press element as a whole. It is clear that a certain wear and/or scratch resistance may be obtained, amongst others, by means of the mineral and/or ceramic particles. However, the material with which said matrix structure is built up may be selected such that one or more other of the preferred features mentioned in the introduction are obtained. Preferably, the material of said matrix structure is at least active at the surface of the press element.

It is noted that such covering layer can be provided on any type of press element. However, preferably this relates to a so-called press plate. It is of particular interest to obtain less friction and/or an easier release for press plates. Still better, this relates to press elements or press plates, which are provided with a structure or texture at said side. Preferably, this structure is provided in and/or on said basic element and/or continues up to the surface of said covering layer. The inventor has found that, when using the covering layers of the invention, the structure and/or texture present on the basic element may remain clearly expressed, even when covering layer thicknesses of more than 30 micrometers, such as, for example, a thickness of 40 micron, are applied. It is clear that such thickness is not necessary in order to obtain certain effects. For example, one may work with a covering layer thickness between 5 and 10 micrometers, or a thickness between 10 and 20 micrometers. Of course, thicknesses between 20 and 50 micrometers are not excluded, wherein preferably one works with a thickness between 20 and 40 micrometers.

Preferably, said covering layer substantially consists of a metallic matrix, whereas said mineral or ceramic particles preferably have a higher hardness than the material forming said matrix structure. A metallic matrix may realize, for example, a good adherence to the press element. This is in particular the case when the press element as such has a metallic basic element, such as a basic element on the basis of steel, aluminum, brass, or any other alloy on the basis of iron, aluminum and/or copper. Of course, according to the invention it is not excluded to use press elements with basic elements of another material, wherein these basic elements then consist, for example, substantially of one or the other synthetic material.

Said metallic matrix preferably comprises cobalt, iron, silicon, titanium, aluminum,

molybdenum, chromium and/or nickel. The matrix either may consist substantially of one of said metals or may consist substantially of an alloy of two or more of these metals. So, for example, an alloy of iron and cobalt or of nickel and cobalt may be used for said matrix structure. By using chromium and/or nickel, a possible tendency of the covering layer to corrosion may be counteracted.

Said mineral or ceramic particles preferably comprise metal nitrides, carbides, borides, carbonitrides and/or oxides. For example, aluminum oxide, titanium nitride, silicon carbide, silicon oxide, titanium diboride, tungsten carbide and the like may be applied. Preferably, said mineral or ceramic particles have an average particle size which is smaller than 20 micrometers, preferably is larger than 100 nanometers and still better is comprised between 0.5 and 10 micrometers. These particle sizes allow a good filling of said matrix. The smaller particle sizes are recommended when the thickness of the covering layer is limited.

The combination of a metallic matrix structure with said ceramic and/or mineral particles may result, for example, in a covering layer which, as such, consists of so-called CERMET or MMC (Metal Matrix Composite). Such materials have already been known for a longer time in a variety of applications, such as for manufacturing cutting tools, however, until now they have not been employed for providing covering layers on press elements suitable for manufacturing laminate. In fact, they have already been employed as covering layers, for example, for cylinders of engines. Hereto, reference is made to WO 99/43872 and US 4,886,583. The present inventor has found that these long-available covering layers might also be applicable for press elements. Contrary to the usual understanding, which also can be found in the prior art, that a covering layer for a press element must be as hard as possible and thus preferably should be built up from a ceramic material, the inventor has found that, by providing a matrix of a less hard component in which harder particles are comprised, and thus, by possibly compromising the hardness of the obtained covering layer, an alternative covering layer can be obtained, with a mixture of features ideally suitable for press elements.

Said covering layer preferably consists for less than 50 percent, or even for less than 30 percent, of the material forming said matrix structure and/or preferably consists for at least 80 percent of said ceramic or mineral particles. This

composition ensures a good hardness in combination with beneficial features of the matrix structure.

Said covering layer may be provided, whether or not directly, on the basic element of the press element. For example, said covering layer and said basic element may be separated by at least one extra layer, for example, separated by an adherence layer, which preferably is of metallic nature.

According to different possible embodiments, the covering layer may be obtained in a galvanic manner. This is the case, for example, when said matrix structure is made of metal. For a non-restrictive example of such covering layer, reference is made to said WO 99/43872 and US 4,886,583. Obtaining such covering layers in a galvanic manner is less cumbersome than the techniques mentioned herein above in connection to the prior art, allows obtaining thick covering layers in an economic manner and, for example, does not necessitate vacuum chambers. The application of vacuum is particularly cumbersome and expensive when press plates or press belts are to be provided with a covering layer, as such press plates, for example, may have a surface of 6 m^2 or more. It is clear that the press elements, more particularly, press plates, of the present invention do not necessarily need to have a size of 6 m^2 or more. The invention in fact also relates to press plates which are smaller than 6 m^2 and which, for example, can be composed to a larger entity. Smaller press plates and composing them has become known as such in the meantime from WO 2006/136949.

In the above, by "galvanic", "electrochemically" is meant. However, it is also possible that such covering layer is performed in a purely chemical manner or in a combined manner of chemical and electrochemical application. In fact, no manner of application is excluded. Preferably, the covering layer can be removed from the press element in a chemical manner, possibly without affecting the basic element with its possible structure and/or texture.

It is noted that by a suitable selection of the material for the matrix and/or the hard particles, a covering layer may be obtained, more particularly a covering layer provided by means of, for example, a galvanic manner, which layer requires little or no finishing treatment. Possibly, though, a thermal finishing treatment in order to harden the obtained covering layer may be performed.

In order to obtain a very good covering layer, in particular the use of iron and cobalt as a metallic matrix structure is recommended. As hard particles, any mineral or ceramic material may be applied. Thus, for example, use can be made of aluminum oxide or corundum.

The invention further also relates to a method for manufacturing laminate in which a press element with the characteristics of the invention is applied. It is clear that this may concern, for example, a DPL or HPL process. Such method allows a more economic production of laminate or laminate-clad panels, such as floor panels or furniture panels.

The present invention is in no way limited to the above-described embodiments; on the contrary may such press elements and methods be realized according to various variants, without leaving the scope of the present invention.

Claims.

1.- Press element for manufacturing laminate, wherein this press element substantially consists of a basic element having a covering layer at least at the side which is intended for being directed towards the laminate, characterized in that said covering layer has a matrix structure in which mineral or ceramic particles are comprised.

2.- Press element according to claim 1, characterized in that said covering layer substantially consists of a metallic matrix, and that said mineral or ceramic particles preferably have a higher hardness than the material forming said matrix structure.

3.- Press element according to claim 2, characterized in that said metallic matrix comprises one or more of the following materials: cobalt, iron, silicon, titanium, aluminum, molybdenum, chromium, nickel.

4.- Press element according to any of the preceding claims, characterized in that said mineral or ceramic particles are selected from one or more of the following materials: metal nitrides, metal carbides, metal borides, metal carbonitrides, metal oxides.

5.- Press element according to any of the preceding claims, characterized in that said mineral or ceramic particles have an average particle size which is smaller than 20 micrometers, preferably is larger than 100 nanometers and still better is comprised between 0.5 and 10 micrometers.

6.- Press element according to any of the preceding claims, characterized in that said covering layer consists for less than 50 percent, and preferably for less than 30 percent, of the material forming said matrix structure.

7.- Press element according to any of the preceding claims, characterized in that said covering layer consists for at least 80 percent of said ceramic or mineral particles.

8.- Press element according to any of the preceding claims, characterized in that said covering layer and said basic element are separated by at least one extra layer, for example, an adherence layer.

9.- Press element according to any of the preceding claims, characterized in that said covering layer relates to a covering layer obtained in a galvanic manner.

10.- Press element according to any of the preceding claims, characterized in that said covering layer can be removed from the press element in a chemical manner.

11.- Method for manufacturing laminate, characterized in that in this method a press element with the characteristics of any of the preceding claims is applied.

INTERNATIONAL SEARCH REPORT

International application No
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A. CLASSIFICATION OF SUBJECT MATTER
INV. B30B15/06

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)
B30B C23C B32B

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 practical, search terms used)
EPO-Internal

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	CH 507 094 A (VER DRAHTWERKE AG [CH]) 15 May 1971 (1971-05-15) column 1, line 1 - line 12; claims; example column 2, line 25 - column 3, line 11	1-11
X	US 5 780 139 A (CARTER LAN [US] ET AL) 14 July 1998 (1998-07-14) column 3, line 19 - line 33; claims; figures	1-10
X	EP 0 140 039 A (HELD KURT) 8 May 1985 (1985-05-08) claims; figures	1-11
X	US 4 816 314 A (PRAWDZIK JOHN [US] ET AL) 28 March 1989 (1989-03-28) claims; figures	1,2,4,11

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[X] Further documents are listed in the continuation of Box C.

[X] See patent family annex.

* Special categories of cited documents :

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier document but published on or after the international filing date

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"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
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Name and mailing address of the ISA/	Authorized officer
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INTERNATIONAL SEARCH REPORT

International application No
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C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 3 909 895 A (ABRAHAMSON GERALD R ET AL) 7 October 1975 (1975-10-07) claims; figures	1-9

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