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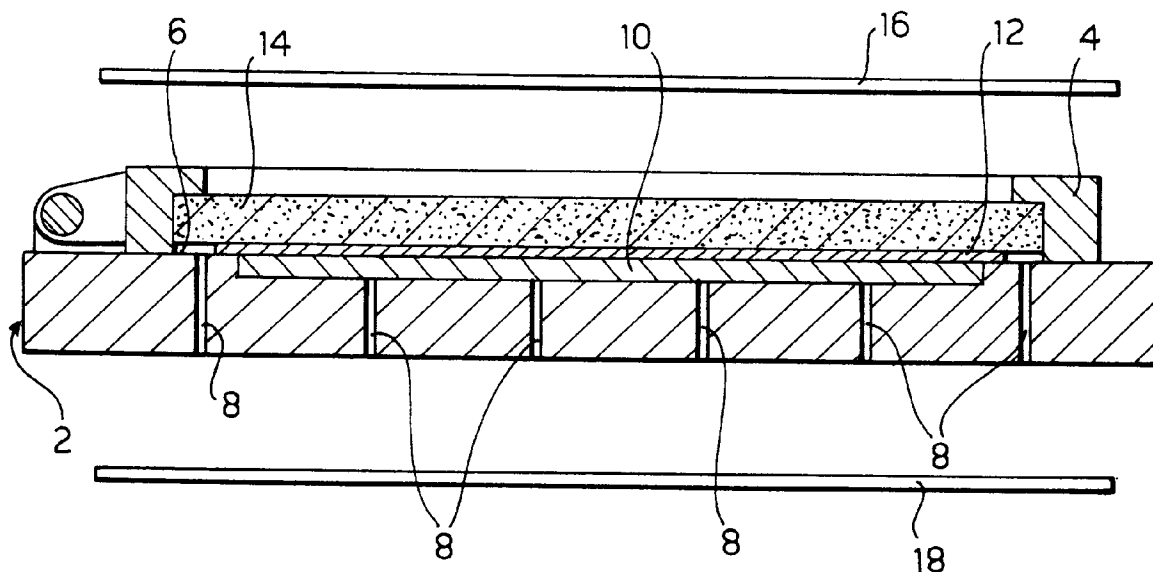
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(54) **A process for transfer printing decorations onto a plastic or metal sheet.**

(57) The printing process comprises the operations of : forming the decoration to be transferred onto the sheet (10) by means of coloured ink on a sheet of paper (12) ; superimposing the said paper sheet (12) over the sheet (10) to be decorated, maintaining them pressed against one another ; and delivering to the said ink, by radiating it with microwaves, a quantity of energy sufficient to cause its transfer onto the sheet (10) to be decorated.



The present invention relates to a process for transfer printing decorations onto a plastics or metal sheet, comprising the operations of:

applying coloured ink to a sheet of paper to form the decoration to be transferred onto the sheet,

superimposing the said sheet of paper onto the sheet to be decorated maintaining them pressed against one another, and

delivering to the said ink a quantity of energy sufficient to cause its transfer onto the sheet to be decorated.

In the known art, the sheet to be decorated and the sheet of inked paper, on which a silicone rubber membrane is superimposed, are maintained in a chamber under vacuum so that the sheet of paper is pressed against the sheet to be decorated. By radiating infra red rays onto the assembly constituted by the membrane, the sheet of paper and the sheet to be printed, sufficient energy is delivered to the ink to allow it to transfer from the paper sheet to the sheet to be decorated, onto which the desired decoration is thus transferred.

If the sheet to be decorated is metal it is possible to utilise an alternative process in which the silicone membrane, the inked paper sheet and the superimposed sheet to be decorated are passed between two counter-rotating heated rollers. In this case, too, transfer of the ink from the paper sheet to the sheet to be decorated is obtained.

Both the above described processes have the disadvantage of requiring the development of a large quantity of heat in excess of that strictly necessary for the ink transfer process, with a consequent wear and tear of the apparatus used and additional costs for the generation of this excess thermal energy.

For the purpose of obviating the said disadvantages the subject of the present invention is a process of the above indicated type, characterised by the fact that the delivery of energy is effected by radiating the ink with microwaves at a high frequency.

With the process according to the invention the energy provided by the microwaves is substantially that necessary to cause transfer of the ink from the paper sheet to the sheet to be decorated. It is thus not necessary to support additional costs for the generation of excess thermal energy, which moreover would involve dangerous over heating of the process apparatus.

A further advantage of the process according to the invention lies in the fact that the transfer of the ink from the paper sheet to the sheet to be decorated is effected in a shorter time than that used by traditional processes.

Further advantages and characteristics of the present invention will become apparent from the following detailed description made with reference to the annexed drawing, provided by way of non-limitative example, in which the single figure schematically

represents in section a device for performing the process of the invention.

The reference numeral 2 generally indicates known clamping apparatus comprising a frame 4 of dielectric material, which defines an internal chamber 6 put into communication by ducts 8 with a pump, not illustrated in the drawing, for generating a vacuum in the chamber 6. Within this latter there are superimposed a sheet of plastics material 10 to be decorated, a paper sheet 12 on which the decoration to be transferred has been preliminarily printed with a coloured ink, and a silicone rubber membrane 14.

On opposite sides of the clamping apparatus 2 there are disposed two flat metal electrodes 16, 18, connected to an electrical generator not illustrated in the drawing and adapted to generate microwaves in a manner known per se.

The operation of the device is as follows. Once the plate 10 the paper sheet 12 and the membrane 14 have been located together in the chamber 6, a given vacuum is created in this latter to press the paper sheet 12 against the sheet 10, then the electrical power generator connected to the two electrodes 16, 18 is activated and thus generates a microwave field within the chamber 6, which causes transfer of the coloured ink from the paper sheet 12 to the sheet 10, on which the desired decoration is thus impressed. Irradiation is effected with high frequency microwaves for a period of time of several seconds.

If it is desired to decorate a metal sheet rather than a sheet of plastics material the microwave generation takes place between a flat metal electrode 16 disposed above the clamping apparatus 2 and the sheet 10, the paper sheet 12 being interposed between the electrode 16 and the sheet 10. In fact, if a microwave generating device formed, as in the preceding case, by two electrodes outside the clamping apparatus were used the metal sheet 10 would act as a screen against the microwaves.

Claims

1. A process for transfer printing decorations onto a sheet (10) of plastics material or sheet metal, comprising the operations of:

forming the decoration to be transferred onto the sheet (10) on a paper sheet (12) with coloured ink,

superimposing the said paper sheet (12) onto the sheet (10) to be decorated, maintaining them pressed against one another, and

delivering to the said ink a quantity of energy sufficient to cause transfer thereof onto the sheet (10) to be decorated,

characterised by the fact that the delivery of energy is effected by radiating the ink with microwaves at high frequency.

2. A process according to Claim 1, characterised by the fact that the microwave radiation is continued for a period of time of several seconds.
3. A process according to any preceding Claim, characterised by the fact that the sheet (10) to be decorated is plastics material, and by the fact that the microwaves are generated between two flat metal electrodes (16,18) between which the paper sheet (12) and the sheet (10) to be decorated are interposed.
4. A process according to Claim 1 or Claim 2, characterised by the fact that the sheet (10) to be decorated is metal and by the fact that the microwaves are generated between the said sheet (10) and a flat metal electrode (16), the paper sheet (12) being interposed between the electrode (16) and the sheet (10).

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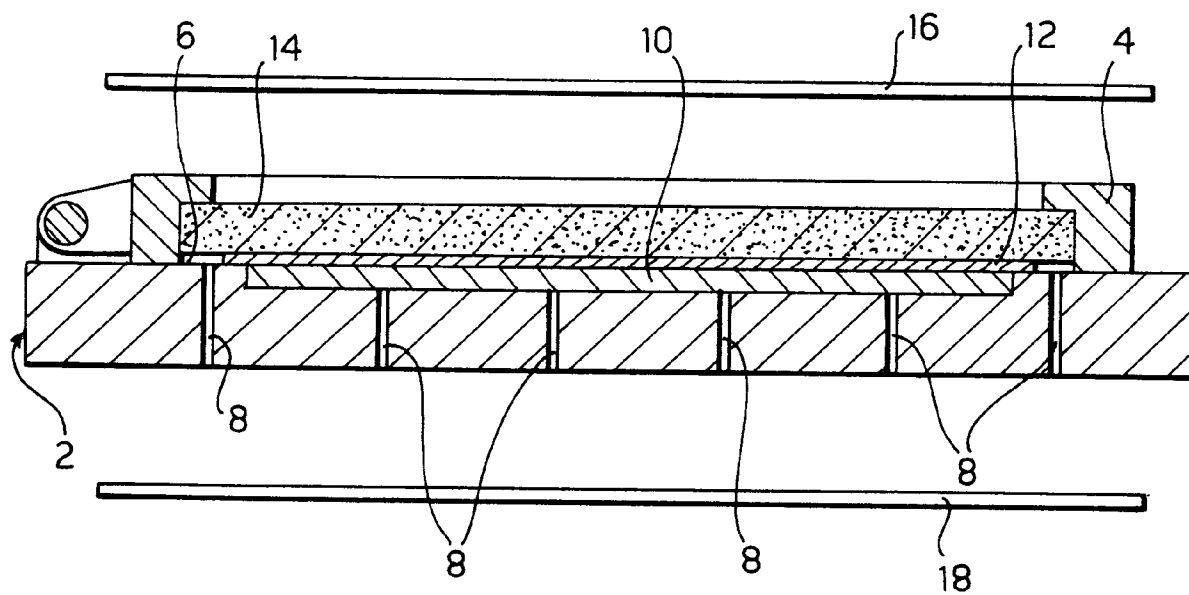
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EUROPEAN SEARCH REPORT

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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)
Y	GB-A-2 117 320 (T.KLISZCZ) * abstract * * page 2, line 26 - line 40 * * page 3, line 85 - line 116 * * figures 5,6 * ---	1-4	B41M5/035 B44C1/17
Y	EP-A-0 333 880 (TOYO SEIKAN KAISHA LTD.) * abstract * * column 9, line 26 - line 38 * ---	1-4	
Y	PATENT ABSTRACTS OF JAPAN vol. 15, no. 283 (M-1137)18 July 1991 & JP-A-3 099 883 (FUJITSU LTD) 25 April 1991 * abstract * ---	1-4	
A	FR-A-2 256 838 (SARL HAGAMEX) * claims 1,3 * ---	1	
A	FR-A-2 383 794 (COMPO INDUSTRIES INC.) * claim 1 * * figure 4 * ---	1	
A	EP-A-0 097 528 (HLH CORPORATION) * claims 1,3 * * figure 6 * * page 6, line 18 - page 7, line 26 * ---	1	B41M B44C
A	PATENT ABSTRACTS OF JAPAN vol. 7, no. 159 (M-228)13 July 1983 & JP-A-58 067 498 (CANON KK) 22 April 1983 * abstract * ---	1	
A	GB-A-1 583 953 (R.D.GLOVER) * page 1, line 53 - line 79 * ---	1	
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The present search report has been drawn up for all claims			
Place of search THE HAGUE		Date of completion of the search 29 MARCH 1993	Examiner MARKHAM R.
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 L : document cited for other reasons & : member of the same patent family, corresponding document			

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Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl.5)
A	DR.O.NEUMÜLLER 'Römpps Chemie-Lexikon' 1985 , FRANCKHSCHER VERLAGSHANDLUNG , STUTTGART,DE 8th edition, volume 4 * page 2612, left column, line 53 - right column, line 9 * -----	1	
			TECHNICAL FIELDS SEARCHED (Int. Cl.5)
The present search report has been drawn up for all claims			
Place of search THE HAGUE		Date of completion of the search 29 MARCH 1993	Examiner MARKHAM R.
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 L : document cited for other reasons ----- & : member of the same patent family, corresponding document			

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