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(54) PROCESS FOR THE PRODUCTION OF A RIBBON WITH PRINTED DECORATIONS, AND RIBBON THUS OBTAINED

(57) A process for the production of a ribbon comprises the steps of subjecting a ribbon (1) woven from polyester fibre to a sanforization treatment (20) wherein the ribbon is compacted at a temperature exceeding 160°C, subjecting the ribbon to sublimation printing (30), and finally subjecting the printed ribbon to a second sanforization treatment (40) wherein the ribbon is compacted at a temperature below 130°C.

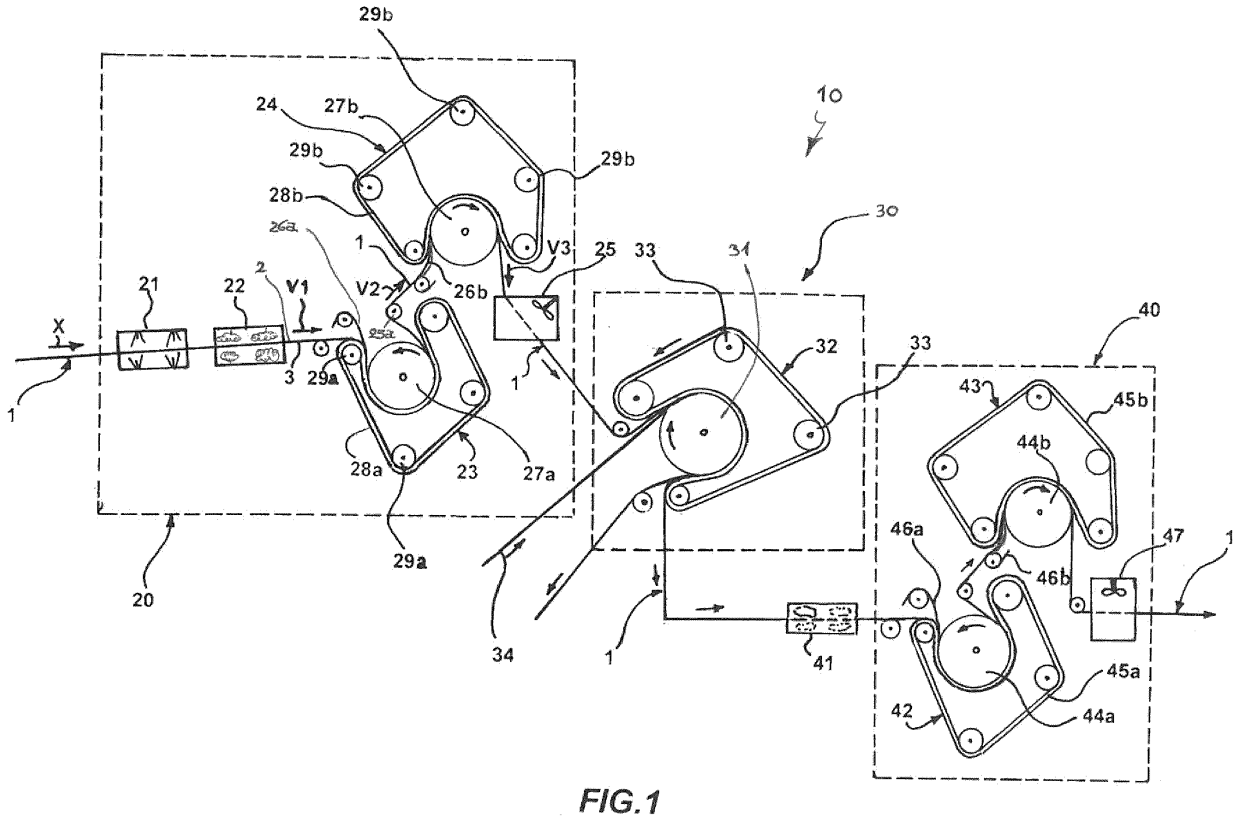

FIG.1

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Description

Technical scope

[0001] The present invention relates to a process for the production of a ribbon provided with printed decorations, having the characteristics set out in the preamble of the main claim.

Technological background

[0002] In the textile sector, the use is known of ribbons provided with printed decorations, which may take the form of pictures, writing or any other graphic form. Typically, these ribbons are printed by means of a process of sublimation printing (also known as "thermal sublimation printing" or "thermal transfer printing").

[0003] Sublimation printing is an indirect printing process mainly used for the decoration of synthetic fabrics, typically those made of polyester or polyurethane fibre. The sublimation printing technique consists of bringing into contact with the ribbon, under high temperature, a special transfer paper (transfer paper or sublimation paper) on to which the desired decoration has previously been printed in mirror-image form. Because of the high temperature, the ink present on the transfer paper passes from the solid state to the gaseous state (sublimation), and is deposited, point by point, on the surface of the ribbon pressed against the transfer paper, thus forming the desired decoration in a permanent and indelible manner.

[0004] This operation is carried out for a predetermined time at a temperature that can vary from 180 to 210°C, under the action of a press that holds the ribbon in contact with the transfer paper.

[0005] A known process for the production of printed ribbons provides for the ribbons, before being subjected to the sublimation printing step, to be subjected to a thermo-fixing step, in which the ribbon is compacted at a high temperature, typically between 180 and 190°C. This prevents the ribbon from shrinking during the subsequent sublimation printing step, causing an undesirable deterioration of the definition of the printed decoration.

[0006] The provision of the thermo-fixing step is considered to be particularly necessary in all ribbons woven from fibres of the discontinuous type, in particular cotton staple fibres, where shrinkage rates as high as 10% - 20% can be experienced.

[0007] However, the thermo-fixing step deprives the ribbon of any significant elasticity.

[0008] It should be noted that in the present description and in the annexed claims, the term "ribbon" means a woven article of predefined width and indefinite length, without any limitation on the dimension of the width or the type of weave used in the weaving process.

[0009] In addition, the term "decoration" means any graphic form obtained by printing on to the surface of a ribbon, including pictures, writing, logos, symbols and images.

Description of the invention

[0010] The problem underlying the present invention is to provide a process for the production of a ribbon with printed decorations, as well as a ribbon obtained by this process, that are designed to overcome the limitations mentioned above with reference to the known prior art.

[0011] In the context of this problem, it is an aim of the invention to provide a process that makes it possible to obtain a printed ribbon with excellent elastic properties and, at the same time, makes it possible to maintain a high degree of definition of the printed images.

[0012] A second aim of the invention is to provide a process that is simple to implement and easy to control.

[0013] The present invention solves this problem and achieves these aims by means of a process for the production of a ribbon implemented in accordance with the claims that follow.

Brief description of the drawings

[0014] The features and advantages of the present invention will become more apparent from the detailed description of a preferred embodiment thereof, illustrated by way of indicative and non-limiting example with reference to the accompanying drawings, in which the sole Figure 1 is a schematic view of a system designed to operate in accordance with the process of the invention.

Preferred embodiment of the invention

[0015] With reference to the sole attached figure, the numeral 10 indicates a system for the production of a ribbon 1 provided with printed decorations, the system being designed to work according to a production process in accordance with the present invention.

[0016] The ribbon 1 has a first face 2 and a second face 3, and is obtained by weaving yarns of synthetic fibre, using any desired weaving scheme. The material used for the creation of the fibres can be of any type suitable to be printed by means of a sublimation process, provided they are of the discontinuous type, preferably cotton staple fibres.

[0017] In the preferred embodiment described here in detail, the ribbon 1 is made of polyester fibre.

[0018] The system 10 comprises a first sanforizing unit 20, a printing unit 30 and a second sanforizing unit 40, placed in succession one after the other, and through which, in the order indicated above, the ribbon 1 is moved in a continuous manner by means of suitable movement means along an advance direction X.

[0019] The first sanforizing unit 20 comprises a cold humidification chamber 21, a hot humidification chamber 22, a first compacting unit 23, a second compacting unit 24 and a cooling device 25.

[0020] In the cold humidification chamber 21, the rib-

bon 1 is bathed with water mist at ambient temperature, preferably between 15°C and 30°C, for a suitable period of time, preferably between approximately 5 and approximately 10 seconds.

[0021] In the subsequent hot humidification chamber 22, the ribbon 1 is subjected to a jet of steam at a temperature between 110°C and 180°C, preferably between 130°C and 150°C, for a suitable period of time, preferably between 4 and 10 seconds, and still more preferably between 6 and 8 seconds.

[0022] In the preferred embodiment described herein, the steam used in the hot humidification chamber 22 has a temperature of approximately 135°C.

[0023] On exiting from the hot humidification chamber 22, the ribbon 1, hot and damp, is fed to the first compacting unit 23 in order to be subjected to the process of controlled compaction of the fibres.

[0024] The ribbon 1 is made to advance at a first speed of movement V1 towards the inlet of the first compacting unit 23 where there is a first braking belt 26a, arranged for braking the ribbon 1 at said inlet, thus regulating the degree of compaction of the ribbon.

[0025] The first braking belt 26a is preferably made of teflon and is supported by a roller whose axis is movable so as to vary the inclination of the braking belt at the inlet of the first compacting unit 23 and therefore vary the force with which the ribbon 1 is braked at the inlet of the first compacting unit 23.

[0026] The first compacting unit 23 comprises a first pressing roller 27a and a first compacting belt 28a looped around a plurality of rollers 29a rotatable in the opposite direction to the first pressing roller 27a in such a way as to cooperate with the latter in order to move and compact the ribbon 1.

[0027] Preferably, the ribbon 1 is fed to the first compacting unit 23 in such a way that the first face 2 is turned towards the first pressing roller 27a and the second face 3 is turned towards the first compacting belt 28a.

[0028] The first pressing roller 27a is heated to a temperature exceeding 160°C, preferably below 200°C, for example at a temperature of approximately 180°C, and is made to rotate at a speed such as to determine a second speed of movement V2 of the ribbon 1, which is typically slower than the first speed of movement V1, according to the shrinkage of the ribbon 1.

[0029] The first braking belt 26a is partially interposed between the first pressing roller 27a and the first compacting belt 28a, so as to brake the advancing movement of the ribbon 1 by forming creases or wrinkles along the advance direction X.

[0030] In particular, adjustment of the length of the first braking belt 26a between the first pressing roller 27a and the first compacting belt 28a, and/or its inclination relative to the direction of entry of the ribbon 1 into the first compacting unit 23, makes it possible to increase or decrease the compaction effect on the ribbon 1 along the direction of advance X.

[0031] In the passage through the first compacting unit 23, a reduction of between 3% and 20% can be seen in the length of the ribbon 1, depending on the fibre used for obtaining the ribbon 1.

[0032] Subsequently, the ribbon 1 is fed by means of a pretensioning roller 25a towards the second compacting unit 24, at whose inlet is provided a second braking belt 26b.

[0033] The second braking belt 26b and the second compacting unit 24 are entirely similar to the first braking belt 26a and the first compacting unit 23.

[0034] Therefore, the second compacting unit 24 comprises a second pressing roller 27b and a second compacting belt 28b looped around a second plurality of rollers 29b rotatable in the opposite direction to the second pressing roller 27b in such a way as to cooperate with the latter in order to move and compact the ribbon 1.

[0035] Preferably, the ribbon 1 is fed to the second compacting unit 24 in such a way that the second face 3 is turned towards the second pressing roller 27b and the first face 2 is turned towards the second compacting belt 28b.

[0036] The second pressing roller 27b is heated to a temperature similar to that of the first pressing roller 27a, and is made to rotate in such a way as to determine a third speed of movement V3 of the ribbon 1, slower than the second speed of movement V2, depending on the shrinkage of the ribbon 1.

[0037] In the passage through the second compacting unit 24, the length of the ribbon further decreases by approximately 1-5%.

[0038] On exiting from the second compacting unit 24, the ribbon 1 passes through the cooling device 25, where the ribbon is rapidly cooled, preferably to room temperature, so as to lock the fibres in the compacted position.

[0039] Downstream of the sanforizing unit 20, the system 10 comprises a printing unit 30, where the ribbon 1 exiting from the first sanforizing unit is subjected to a sublimation printing treatment that can be performed on the first face 2 or on the second face 3 of the ribbon 1.

[0040] In versions not shown, the printing treatment may be applied to both faces of the ribbon 1.

[0041] The printing unit 30 is of a conventional type per se and comprises a rotating print drum 31 and a compacting belt 32 looped around a plurality of rollers 33 rotatable in the opposite direction to the print drum 31. The compacting belt 32 is located close to the print drum 31 in such a way as to move and press the ribbon 1 against the print drum 31.

[0042] Between the print drum 31 and the compacting belt 32 is introduced, together with the ribbon 1, a transfer paper 34 (sublimation paper), which is then pressed by the print drum 31 and the compacting belt 32 against the first or the second face 2, 3 of the ribbon 1. The surface of the transfer paper 34 in contact with the ribbon 1 carries, in mirror-image form, the decoration that is desired to be printed on the ribbon 1.

[0043] The print drum 31 is heated to an appropriate temperature, suitable for the sublimation process, for ex-

ample approximately 200°C, so that the ink present on the transfer paper 34 changes to the gaseous state and is deposited on the surface of the ribbon 1 with which it is in contact, according to the known methods in the state of the art of sublimation printing.

[0044] Downstream of the printing unit 30, the system 10 has the second sanforizing unit 40, into which the ribbon 1 is fed immediately after exiting from the sublimation printing step.

[0045] The second sanforizing unit 40 is similar to the first sanforizing unit 20 and comprises a hot humidification chamber 41, a first compacting unit 42, a second compacting unit 43 and a cooling device 47.

[0046] In hot humidification chamber 41, the ribbon 1 is subjected to a jet of steam at a temperature between 110°C and 180°C, preferably between 130°C and 150°C, for a suitable period of time, preferably between 2 and 5 seconds. With respect to the first sanforizing unit 20, no cold humidification chamber is provided, and the time spent by the ribbon 1 in the hot humidification chamber 41 is generally lower.

[0047] The first and second compacting units 42 and 43 of the second sanforizing unit 40 are essentially similar to the first and second compacting units 23, 24 of the first and second sanforizing units 20.

[0048] The first compacting unit 42 of the second sanforizing unit 40 comprises respectively a first pressing roller 44a and a first compacting belt 45a, which runs in the opposite direction of rotation, pressing the ribbon 1 passing between them. At the inlet of the first compacting unit 42 is provided a first braking belt 46a, of adjustable length, whose function is to brake the ribbon 1 and adjust the degree of compaction imparted to the ribbon 1.

[0049] Similarly, the second compacting unit 43 of the second sanforizing unit 40 comprises respectively a second pressing roller 44b and a second compacting belt 45b, which runs in the opposite direction of rotation, pressing the ribbon 1 passing between them. At the inlet of the second compacting unit 43 is provided a second braking belt 46b, of adjustable length, whose function is to brake the ribbon 1 and adjust the degree of compaction imparted to the ribbon 1.

[0050] The difference with respect to the first sanforizing unit 20 lies in the fact that the temperature of the pressing rollers 44a and 44b at which the ribbon 1 is compacted in the second sanforizing unit 40 is below 130°C.

[0051] Preferably, said temperature is between 100 and 110°C.

[0052] The temperature of the second sanforization treatment is maintained at a value lower than that used in the first sanforization treatment so as not to damage the decoration printed on the ribbon 1.

[0053] On exiting from the second compacting unit 43 of the second sanforizing unit 40, the ribbon 1 passes through the cooling device 47, where the ribbon is rapidly cooled, preferably to room temperature, so as to lock the fibres in the compacted position.

[0054] In the passage through the second compacting unit 40, a reduction of a few percentage points, for example approximately 4-8%, can be seen in the length of the ribbon 1.

[0055] In a preferred variant of the invention, the process, rather than being continuous, is carried out in three successive and separate processing stages, consisting respectively of the first sanforization treatment, the sublimation printing and the second sanforization treatment. In this case, between one step and the next, the ribbon 1 is collected and stored before being passed to the succeeding processing unit.

[0056] The ribbon 1 obtained by the process of the invention described above has a considerable elasticity, ranging between approximately 12% and approximately 17%, while maintaining an extremely good degree of definition of the printed decorations.

[0057] In particular, it has been found that the ribbon 1 thus obtained has elasticity values higher than those offered by a ribbon that has not been subjected to the second sanforization treatment.

Claims

1. Process for the production of a printed ribbon, comprising the steps of:

   - subjecting a ribbon (1) made of synthetic fabric of the discontinuous fibre type to a first sanforization treatment (20) in which said ribbon is compacted at a temperature above 160°C,
   - subjecting said ribbon to sublimation printing (30), and
   - subjecting said printed ribbon to a second sanforization treatment (40) in which said ribbon is compacted at a temperature below 130°C.

2. Process according to claim 1, wherein said second sanforization treatment is performed at a temperature between 100°C and 110°C.

3. Process according to any one of the preceding claims, wherein said ribbon is made of cotton staple polyester fibres.

4. Process according to any one of the preceding claims, wherein said first sanforization treatment is performed at a temperature between 170°C and 190°C.

5. Process according to any one of the preceding claims, wherein said sublimation printing is performed at a temperature of approximately 200°C.

6. Process according to any one of the preceding claims, wherein said first and second sanforization treatments (20, 40) comprise at least one compact-

ing phase (23, 24; 42, 43) in which said ribbon is compacted in a wrinkled configuration between at least one pressing roller (27a, 27b; 44a, 44b) and at least one compacting belt (28a, 28b; 45a, 45b) and said ribbon is guided into the inlet of said compacting phase by a braking belt (26a, 26b; 46a, 46b) interposed between said at least one pressing roller and said at least one compacting belt.

7. Process according to the preceding claim, wherein the length of said braking belt interposed between said at least one pressing roller and said at least one compacting belt is adjustable.

8. Process according to claims 6 and 7, wherein, upstream of said compacting phase, said first sanforization treatment (20) comprises a step of cold humidification (21) in which said ribbon is bathed with water mist at ambient temperature, and a step of hot humidification (22) in which said ribbon is subjected to a jet of steam at a temperature between approximately 130°C and 150°C.

9. Process according to any one of claims 6 to 8, wherein, upstream of said compacting phase, said second sanforization treatment (40) comprises a step of hot humidification (41) in which said ribbon is subjected to a jet of steam at a temperature between approximately 130°C and 150°C, without the provision of a step of cold humidification.

10. Woven ribbon provided with printed decorations, made of fibres of the discontinuous type, **characterised in that** it has an elasticity between 12% and 17%.

11. Ribbon according to claim 10, made of cotton staple polyester fibres.

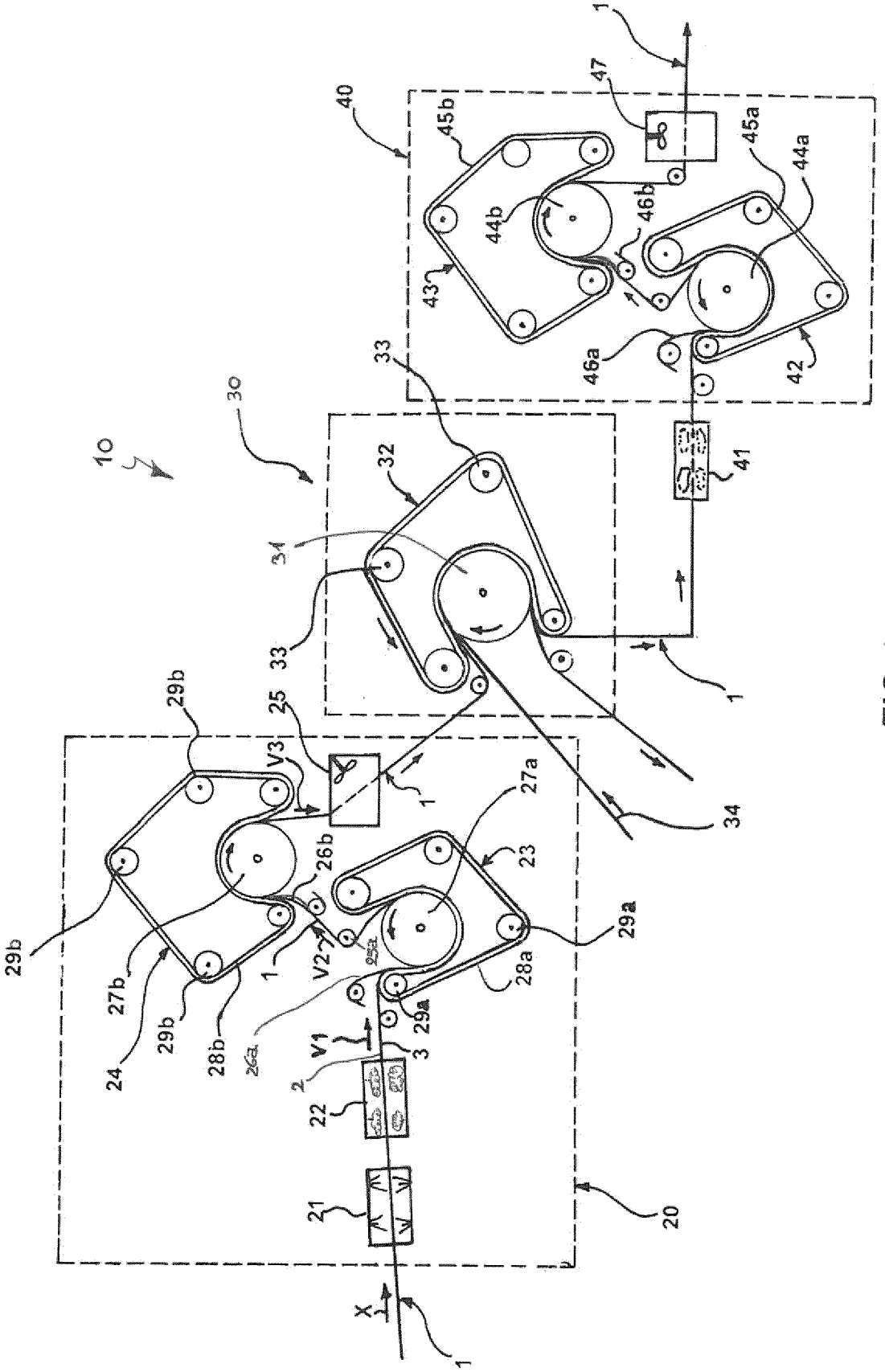
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FIG.1

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EUROPEAN SEARCH REPORT

Application Number
EP 16 17 9978

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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	6 December 2016	Bichi, Marco

CATEGORY OF CITED DOCUMENTS

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