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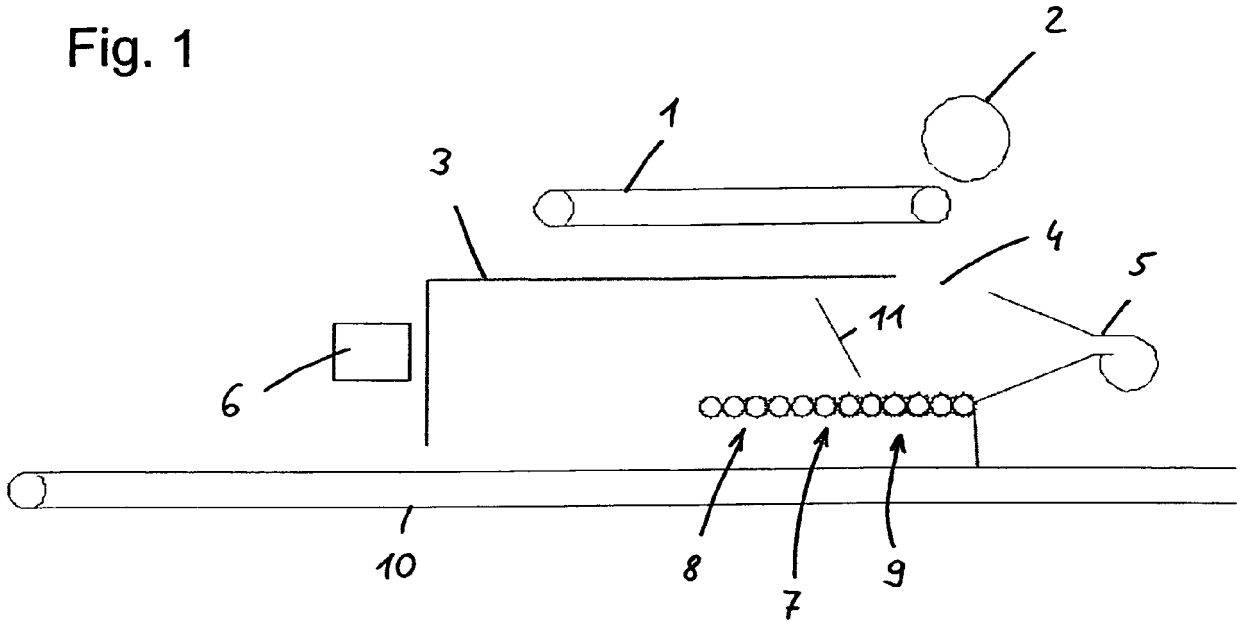
(54) Apparatus and method for scattering particles in a particle board production

(57) The invention relates to an apparatus for scattering particles for forming particle mats in a particle board production process, the apparatus having a source (1) for supplying particles to at least one roller array (7) for spreading the particles onto a mat conveyor (10), wherein an airflow for scattering the particles onto the at least one roller array (7) is provided above the uppermost roller array (7).

Further, the invention relates to a method for scattering particles for forming particle mats in a particle board production process.

Fig. 1



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Description

[0001] The present invention relates to an apparatus and a method for scattering particles for forming particle mats in a particle board production process.

Background of the invention

[0002] Traditionally particleboard surfaces are formed using wind forming heads. Using air separation, it is possible to arrange the particles in a desired order based on the geometry of particles.

[0003] EP 0 483 742 B1 describes a device for distributing fibrous material, the device being of the mechanical type. The big advantages of this forming unit were the accuracy and evenness of the formed surface layer. This type of forming is ideal for e.g. clean sawdust where all particles have more or less the same geometry.

[0004] However, the wind formers took their market position later back due to disadvantages of this kind of roller formers. The cubicle particles were located on depth from the surface that was sanded off. Cubicle particles oriented randomly and grain direction not mainly parallel to the board surface had two negative effects. Firstly, the surface was more porous after the sanding, and secondly, the board edges were more brittle. While the heavier particles like minerals also reached the board's outer surface, the consequence was higher sanding belt and machining tool wearing.

[0005] It was recognized that with roller formers targeting very fine surface, smaller pattern rollers were needed to achieve a fine particle board surface. This comes along with the disadvantage that friction from side walls could hinder the particle material flow leading to different (coarser) structure on panel edges.

[0006] Another approach was to use a higher air chamber underneath the rollers as described in WO 2008/068378 A1.

Summary of the invention

[0007] It is an object of the present invention to find an alternative apparatus and method for scattering particles in a particle board production.

[0008] This object is solved with an apparatus and method according to the independent claims. Advantageous further developments are subject of the dependent claims.

[0009] According to an embodiment of the invention, an apparatus for scattering particles for forming particle mats in a particle board production process is provided, the apparatus having a source for supplying particles to at least one roller array for spreading the particles onto a mat conveyor, wherein an airflow for scattering the particles onto the at least one roller array is provided above the uppermost roller array. The source is preferably a dosing conveyor. The term "mat" refers to the sorted accumulation of particles before being pressed to a particle board. The term "uppermost" roller array refers to the roller array (in case more than a single roller array is provided) which is reached first by the particles along a particle falling path when the particles fall from the source onto the roller array. This means, the space along the particle falling path in between the source and the airstream is free of further roller arrays. In this context, the term "roller array" refers only to roller arrays which are used for spreading the particles after falling off the source and before falling onto the mat conveyor. This way, a hybrid forming head combining the advantages of mechanical roller former and traditional wind forming head is provided for spreading a surface layer of a particleboard. The main advantages of this system is that the air separation is used to separate fine particles having an optimum shape for the final surface (sanded) of the panels onto the fine rollers.

[0010] According to a further embodiment of the invention, the at least one roller array comprises different rollers adapted to different particle sizes, wherein coarse pattern rollers which are adapted to larger particle sizes compared to fine pattern rollers are positioned closer to a blower for generating the airflow. This way, the airflow blows finer particles farther than coarser particles, such that the finer particles are blown onto fine pattern rollers adapted to the finer particles and the coarser particles are blown onto coarse pattern rollers adapted to the coarser particles. Preferably, the heavier particles are put exclusively onto coarse pattern rollers. This way, the cubicle particles and minerals are separated deeper from the panel surface by means of coarser rollers, and the board is provided with better surface and paned edge properties. Moreover, while the coarser minerals will not go over the fine rollers like in traditional roller formers, the wearing of the finer roller is of a substantial lower level and this type of roller former could be the only economical solution for recycled wood material having a lot of impurities. Also, in the described forming apparatus, the whole surface material flow is not needed to move forward by fine pattern rollers, which leads to the opportunity of using finer rollers and higher capacities (material thickness on the rollers).

[0011] According to a yet further embodiment of the invention, the rollers are provided with projections on their rolling surfaces, and an average of a depth of the projections of the coarse pattern rollers is larger than an average of adjacent depth of the projections of the fine pattern rollers.

[0012] According to another embodiment of the invention, the rollers are provided with projections on their rolling surfaces, and on at least 90% of each rolling surface, the depth of the projections of a fine pattern roller is at least 0.3mm and smaller than 1.2mm. Preferably, the rollers have a circular cylindrical shape. The term "rolling surface" refers to the curved surface of the cylindrical shape encircling the axis of the cylinder shape.

[0013] According to a further embodiment of the invention, the rollers are provided with projections on their roll-

ing surfaces, and wherein on at least 90% of each rolling surface, the depth of the projections of a coarse pattern roller is at least 1.2mm and at most 5mm.

[0014] According to another embodiment of the invention, the projections have the shape of pyramids or cones.

[0015] According to a further embodiment of the invention, moisture of the particles is dried by the airflow upstream the uppermost roller array.

[0016] According to another embodiment of the invention, a method for scattering particles for forming particle mats in a particle board production process is provided, the method comprising the steps of supplying particles by a source onto at least one roller array; providing an airflow above the uppermost roller array, and spreading the particles onto a mat conveyor by means of the at least one roller array.

[0017] According to another embodiment of the invention, the method further comprising the step of blowing finer particles further than coarser particles, such that the finer particles are blown on fine pattern rollers adapted to the finer particles and the coarser particles are blown on coarse pattern rollers adapted to the coarser particles.

[0018] It is explicitly intended that the teaching of this invention covers any combination of the above described embodiments.

[0019] These and other embodiments are described in more detail with reference to the accompanying drawings.

Brief description of the Figures

[0020]

Fig. 1 schematically illustrates the apparatus for scattering particles according to an embodiment of the invention;

Fig. 2 shows a roller array of the apparatus shown in Fig. 1;

Fig. 3a is a cross-sectional view of a roller of the apparatus shown in Fig. 1, and

Fig. 3b shows a roller pattern of the roller shown in Fig. 3a.

Detailed description of embodiments

[0021] It was found by the inventors of the present invention that using a wind chamber above the rollers will give the best result.

[0022] Fig. 1 schematically illustrates the apparatus for scattering particles according to an embodiment of the invention. Flakes or particles are introduced into the apparatus by means of a dosing conveyor 1 acting as a source, the dosing conveyor 1 being formed as an endless belt conveyor. Alternatively, the source could also be a shute. At the end of the dosing conveyor 1, from which the particles fall off the dosing conveyor 1, there is provided a drop roller 2 for dosing and evening the particle stream on the dosing conveyor 1. Underneath, with respect to gravity force, the dosing conveyor 1, there is arranged a wind chamber 3, an opening 4 of which is provided on its upper side in a dip line with respect to the end of the dosing conveyor 1 such that the particles falling off the dosing conveyor 1 drop through the opening 4 into the wind chamber 3. In practice, the wind chamber is often referred to as wind forming head. The wind chamber 3 is provided with a blower 5 for generating an airstream streaming through the wind chamber 3 to a suction point 6 of the wind chamber 3 in a substantially horizontal direction. The blower 5 is preferably located at an end of the wind chamber 3 at which also the opening 4 is located. Below the airstream within the wind chamber 3, a roller array 7 is arranged onto which the particles coming from the dosing conveyor 1 drop after being scattered by the airstream. The rollers of the roller array 7 are cylindrical rollers having later described projections formed on their cylindrical outer surfaces. The rollers are arranged besides each other along a horizontal direction. Using the airstream created by the blower 5, the fine, flat and fibrous material is blown onto fine pattern rollers 9. The coarser, cubicle and heavier particles will drop on coarse pattern rollers 9.

[0023] Fig. 3a and 3b illustrates a roller and its roller pattern used as fine pattern rollers 8 and coarse pattern roller 9, wherein the fine pattern rollers distinguish from the coarse pattern rollers by the pattern dimensions. These rollers comprise projections on their rolling surfaces which is the surface formed by the circumference of the circular cylindrical outer surface shown in Fig. 3a. The projections are in form of pyramids or cones. These projections are manufactured by providing the roller with grooves 12 extending along the rolling surface in a spiral shape. The depth 13 of the grooves 12 is at least 0.3mm and less than 1.2 mm for the fine pattern rollers 8, and at least 1.2mm and at most 5 mm for the coarse pattern rollers 8. Fig. 3b shows a front view (view from the left or right side of Fig. 3a) of the roller pattern. The grooves 12 for forming the projections are formed in counter directions. A plurality of right handed grooves 12a is formed in the rolling surface in a spiral shape and in parallel to each other. Another plurality of left handed grooves 12b is formed in the rolling surface in a spiral shape and in parallel to each other. The plurality of right handed grooves 12a forms an angle on the rolling surface with the plurality of left handed grooves 12b, such that they extend in counter directions.

[0024] Referring back to Fig. 1 and 2, the roller array 7 comprises a plurality of rollers wherein a plurality of these rollers which are closest to the blower 5 are coarse pattern rollers 9 and wherein the plurality of these rollers which are farthest away from the blower 5 are fine pattern rollers 8. In this embodiment, the right half of the rollers of the roller array 7 are coarse pattern rollers 9 and the left half of the rollers of the roller array 7 are fine pattern rollers 9. It is however also possible, that the roller array 7 comprises not only two, but a plurality of different rollers, such that for example the roller patter becomes succes-

sively smaller with an increasing distance from the blower 5, or it would be possible to provide not only two, but three, four, five, six, etc. different groups of rollers distinguishing from each other by their pattern and/or pattern dimensions. The pattern on the rollers 8, 9 is not limited to the above mentioned projections, but also other roller patterns could be used as known from the state of the art. In both roller beds it is possible to mix different roller patterns within the specified range. Also the gaps between the rollers 8, 9 could vary depending on the usage as coarse pattern roller 9 or fine pattern roller 8. The rollers of the roller array 7 rotate such that they rotate on their upper side against the direction of the airstream. After the particles drop onto the rollers 8, 9, they fall through the gap between the rollers onto a mat conveyor 10 which is in the form of an endless conveyor belt. The particles for a so-called mat on this mat conveyor 10, which is conveyed to a pressing apparatus for pressing a particle board. Between the dosing conveyor 1 and roller array 7 and arranged in the falling path of the particles, evening elements 11, such as a screen, a spiral-shaped pin-type roller, a runged wheel type roller ("hamster" type roller) or disks, may be used to even the airstream and to prevent turbulences. A "pin-type roller", in accordance with the present invention, shall be understood as being a roller comprising multiple pins (or rods, or bars), preferably arranged in substantially parallel relationship to the axis of rotation of the roller, such that said pins, upon rotation of the roller, move on concentric circular paths around the axis of rotation of said roller. Preferred pin-type rollers are runged wheel type rollers, and spiral-shaped pin-type rollers. Spiral-shaped pin-type rollers are known, e.g., from DE 102 06 595. A runged wheel type roller is a roller having a plurality of bars or pins in parallel to the axis of the roller, the bars or pins being arranged such that they all have the same distance to the axis and such that they are arranged in regular intervals on a circle encircling the axis. A runged wheel type roller, according to the invention, shall be understood as being a pin-type roller, in which multiple pins are arranged such that, in a cross-sectional plane, the multiple pins lie on preferably one, optionally multiple, concentric circle(s) around the axis of rotation of the roller. The pins of a runged wheel type roller can all be parallel to the axis of rotation of the roller, but the runged wheel type roller can also be twisted, such that, e.g., the pins of the roller angled with respect to the axis of rotation, or the individual pins may describe a helical path from one end of the roller to the other end. runged wheel type roller are well known from, e.g., US 3,487,911. A screen is formed as a woven screen mesh from wires. The size of those screen openings is typically between 2 by 2 mm to 10 by 10 mm depending on the application. The thickness of those wires could also vary.

[0025] In the above described embodiment only a single roller array 7 is provided. However it should be noted that also more than one roller array could be provided such that an additional roller array for spreading the particles is for example provided in between the illustrated roller array 7 and the mat conveyor 10.

[0026] It is explicitly intended that the teaching of this invention covers any combination of the above described aspects of this embodiment.

[0027] While the invention has been illustrated and described in detail in the drawings and foregoing description, such illustration and description are to be considered illustrative or exemplary and not restrictive and it is not intended to limit the invention to the disclosed embodiment. The mere fact that certain measures are recited in mutually different dependent claims does not indicate that a combination of these measures cannot be used advantageously. Any reference signs in the claims should not be construed as limiting the scope of the invention.

Claims

1. An apparatus for scattering particles for forming particle mats in a particle board production process, the apparatus having a source (1) for supplying particles to at least one roller array (7) for spreading the particles onto a mat conveyor (10), wherein an airflow for scattering the particles onto the at least one roller array (7) is provided above the uppermost roller array (7).

2. The apparatus according to claim 1, wherein the at least one roller array (7) comprises different rollers (8, 9) adapted to different particle sizes, wherein the rollers (9) which are adapted to larger particle sizes compared to the remaining rollers (8) of the at least one roller array (7) are positioned closer to a blower (5) for generating the airflow.

3. The apparatus according to claim 2, wherein the rollers (8, 9) are provided with projections on their rolling surfaces, and wherein an average of a depth of the projections of coarse pattern rollers (9) is larger than an average of a depth of the projections of fine pattern rollers (8).

4. The apparatus according to claim 3, wherein the rollers (8, 9) are provided with projections on their rolling surfaces, and wherein on at least 90% of each rolling surface, the depth of the projections of a fine pattern roller is at least 0.3mm and smaller than 1.2mm.

5. The apparatus according to claim 3 or 4, wherein the rollers (8, 9) are provided with projections on their rolling surfaces, and wherein on at least 90% of each rolling surface, the depth of the projections of a coarse pattern roller is at least 1.2mm and at most 5mm.

6. The apparatus according to any one of claims 3 to

5, wherein the projections have the shape of pyramids or cones.

7. The apparatus according to one of the preceding claims, wherein moisture of the particles is dried by the airflow upstream the roller array (7).

8. A method for scattering particles for forming particle mats in a particle board production process, the method comprising the steps of
supplying particles by a source (1) onto at least one roller array (7);
providing an airflow above the uppermost roller array (7), and
spreading the particles onto a mat conveyor (10) by means of the at least one roller array (7).

9. The method according to claim 8, further comprising the step of
blowing finer particles further than coarser particles, such that the finer particles are blown on fine pattern rollers (8) adapted to the finer particles and the coarser particles are blown on coarse pattern rollers (9) adapted to the coarser particles.

10. The method according to claim 8 or 9, wherein moisture of the particles is dried by the airflow upstream the uppermost roller array (7).

Fig. 1

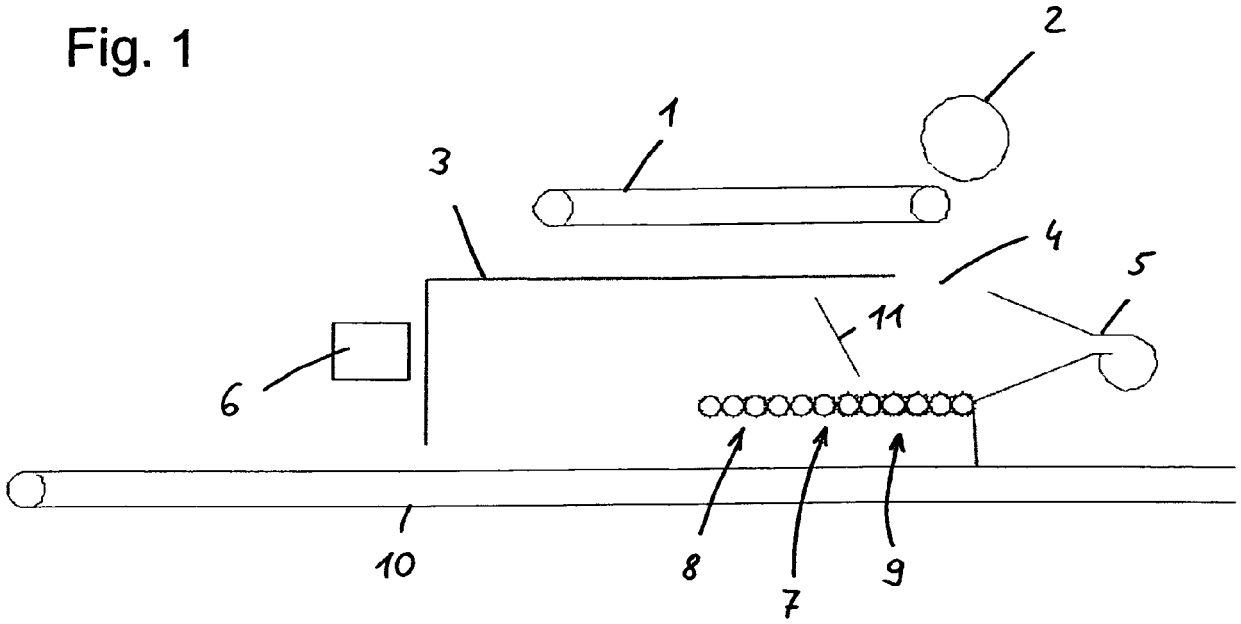
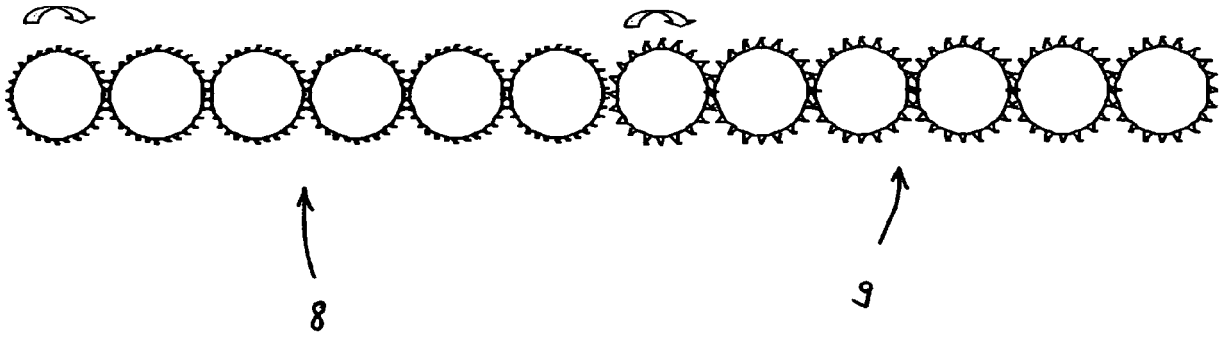


Fig. 2



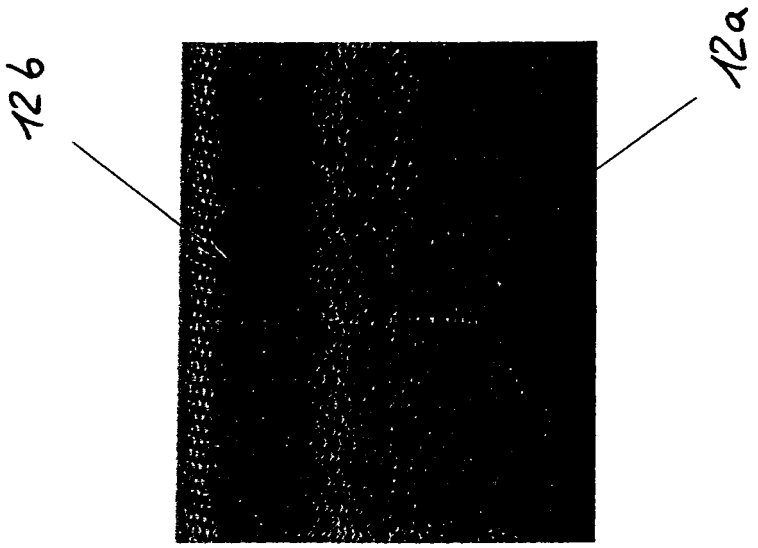


Fig. 3b

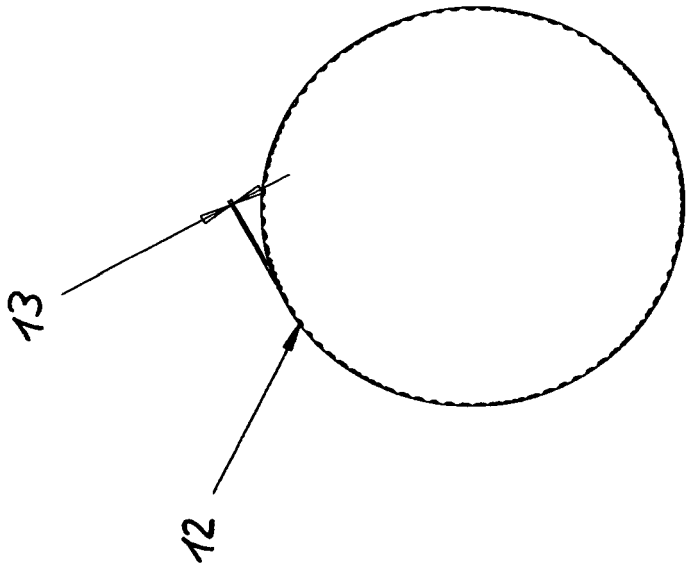


Fig. 3a

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EUROPEAN SEARCH REPORT

Application Number
EP 12 00 0850

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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
The Hague	18 April 2012	Söderberg, Jan-Eric

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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A : technological background
O : non-written disclosure
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E : earlier patent document, but published on, or after the filing date
D : document cited in the application
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EPO FORM 1503 03.82 (P04C01)

ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 12 00 0850

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For more details about this annex : see Official Journal of the European Patent Office, No. 12/82

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