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(54) **Method and device for limiting standstills on an Axminster weaving machine**

(57) The present invention relates, on the one hand, to a method for limiting standstills in a weaving device of the Axminster type, in which, in at least one pile yam carrier, at least one pile yam of the same type is presented at a first and at least one second selectable position and that, following detection of the absence of this pile yam after selection at the first selectable position, the pile yam

carrier furthermore presents this pile yam from the second selectable position. Preferably, detection of the absence of a pile yam is carried out at the position of the pile yam grippers or intermediate holders. On the other hand, the present invention relates to a weaving device provided to carry out such a method.

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Description

[0001] The present invention relates, on the one hand, to a method for limiting standstills in a weaving device of the Axminster type, comprising one or more driven pile yarn carriers for selecting one or more pile yarns in accordance with a pattern to be woven, which, in a selected position, are presented directly or via an intermediate holder to grippers driven by an oscillating gripper bar and provided to insert the selected pile yarn into the fabric by rotation of the gripper bar, in which said weaving device furthermore comprises a detection device for detecting missing pile yarns. On the other hand, the present invention relates to a device provided to carry out such a method.

[0002] An Axminster weaving machine is provided with:

- pile yarn carriers on a carrier system which is driven by a jacquard device;
- pile yarn grippers which are situated on a gripper bar;
- a pile yarn-cutting system.

[0003] As a rule, pile yarn carriers and pile yarn grippers are both present in equal numbers and arranged according to the weft direction. The number of pile yarn grippers determines the density of the fabric in the weft direction.

The pile yarn carriers on the carrier system are driven by a jacquard device in order to present the desired pile yarns in accordance with the pattern to be woven to the pile yarn grippers. These grippers in each case securely hold the pile yarn selected by the corresponding pile yarn carrier. In the manner known from the prior art, the pile yarns selected by the pile yarn carriers are cut to the desired tuft length by a pile yarn-cutting system.

Devices are also known, such as described in European patent publication EP 759101, in which one pile yarn carrier serves several pile yarn grippers by using an intermediate holder in which the pile yarn carriers provide all the pile yarn positions (optionally, if there are grippers) with pile yarns in a pattern-based manner.

[0004] Then, the intermediate holder turns towards the pile yarn grippers which take hold of the pile yarns and are taken to the base fabric by a rotation of the gripper bar and tied up as pile tuft over weft threads introduced in the base fabric and which beat it up against the fabric line using the weaving reed after the introduction of a weft thread.

The pile yarns cut to tuft length are either cut when they are situated in the pile yarn grippers or they are cut when they are situated in the intermediate holder.

[0005] It is possible for irregularities to occur in the process described, in which case there is no pile tuft in the gripper or intermediate holder in order to cut the pile yarn, because, for example:

- a pile yarn gripper or intermediate holder is not ca-

pable of pulling a selected pile yarn through the pile yarn carrier over the desired distance because, for example:

- ° the pile yarn, due to resistance from the weaving creel or as a result of a damaged or weakened clamping spring in the pile yarn carrier, does not protrude sufficiently from the pile yarn carrier for the pile yarn gripper or the intermediate holder to securely hold the pile yarn;
- ° the pile yarn gripper or intermediate holder loses the pile yarn during its relative movement with respect to the pile yarn carrier because a knot in the pile yarn prevents the tensioning force of the gripper or the intermediate holder suffices to pull the pile yarn sufficiently far from the pile yarn carrier;
- ° a pile yarn gripper or intermediate holder is damaged and no longer capable of securely holding a pile yarn.

In this case, the pile yarn gripper or intermediate holder does not contain pile yarn and an intended pile yarn will be missing in the fabric for the remainder of the weaving cycle. This may occur sporadically and only once, but may also occur several times in succession, so that the resulting fault will, in particular in the latter case, be clearly apparent in the fabric and the woven product will be lost or require an expensive after-treatment.

[0006] Solutions are known in the prior art for detecting and indicating missing pile yarns in the pile yarn grippers or intermediate holders. In this case, the machine is stopped immediately or stopped after applying an algorithm to the detected missing pile yarns (for example after 2 or 3 successive stops) so that further damage to the device or quality issues relating to the product can be prevented.

However, such stops are disadvantageous as they result in significant production losses. The production loss is the total of the time periods for, inter alia, carrying out the following steps:

- the operator notices the standstill;
- he interrupts or ends the task which he is carrying out at that point in time;
- he investigates why the machine has come to a standstill;
- he investigates on which pile yarn gripper or intermediate holder the missing pile has been detected;
- he rectifies the fault;
- he restarts the machine.

Out of the total production standstill time which results from stopping the machine due to a missing pile yarn being detected in a gripper or intermediate holder, investigating on which pile yarn gripper or intermediate holder the pile yarn is missing and rectifying the fault usually only constitutes a small fraction.

[0007] It is an object of the invention to limit the production standstill resulting from stopping the machine when a missing pile yarn is detected without affecting the permitted faults in the fabric, in other words by not changing the algorithm of permitted faults in the fabric.

As has been mentioned before, solutions are already known for detecting and indicating missing pile yarns in the pile yarn grippers or intermediate holders.

[0008] Thus, British patent publications GB2096651 and GB 392757 describe that by providing transmitter/receiver systems which are provided on the moving part of the pile yarn-cutting system and first transmitter/receiver systems of which, prior to the cutting of the pile yarn (which is usually taut between the pile yarn carrier and the pile yarn gripper), detect the presence of pile yarn grippers and second transmitter/receiver systems of which detect the presence of pile yarns. The electronic signals are passed to a control unit which mainly determines if grippers for which no pile yarn is detected are being detected. Such a combination of data indicates the absence of a pile tuft.

Based on predetermined frequencies for the occurrence of such faults at well-defined locations, this control unit can generate a signal to stop the machine and prevent further damage to the fabric or the machine.

[0009] In order to prevent the sensors from having to move along with the pile yarn-cutting device and in accordance with GB 2240990, the sensors for detecting the presence or absence of pile yarns are incorporated into a mechanical component which extends across the width of the weaving machine, with the mechanical component comprising one channel per gripper through which the top of the gripper moves with the yarn held in the gripper, with one receiver per channel being provided which can detect the presence or absence of a pile yarn as a result of optionally completely or partially receiving a light beam emitted underneath the relevant channel.

[0010] The patent applicant provides his Axminster weaving machine MAX63 with a device having a strip light which is situated on the gripper bar behind the selected pile yarns during their transfer from the pile yarn carrier to the pile yarn gripper. Cameras are mounted on a frame which is separate from the weaving machine and is behind the weaver, which cameras take a picture of the light which is emitted by the strip light. Prior to cutting by the cutting system, the selected pile yarns which are pulled through the pile yarn carriers by the pile yarn grippers are situated between the strip light and the cameras, so that the pile yarns can be seen against the light of the strip light in the picture taken by the cameras. By processing the picture taken, the control unit detects where pile yarns are missing.

[0011] However, none of the above-described methods propose a solution for limiting the production standstill which results from stopping the machine when missing pile yarn has been detected without affecting the permitted faults in the fabric.

[0012] The object of the invention is achieved by pro-

viding a method for limiting standstills in a weaving device of the Axminster type, comprising one or more driven pile yarn carriers for selecting one or more pile yarns in accordance with a pattern to be woven, which, in a selected position, are presented directly or via an intermediate holder to grippers driven by an oscillating gripper bar and provided to insert the selected pile yarn into the fabric by rotation of the gripper bar, in which said weaving device furthermore comprises a detection device for detecting missing pile yarns. The method according to the present invention is characterized by the fact that, in at least one pile yarn carrier, at least one pile yarn of the same type is presented at a first and at least one second selectable position and that, following detection of the absence of this pile yarn after selection at the first selectable position, the pile yarn carrier furthermore presents this pile yarn from the second selectable position. Preferably, detection of the absence of a pile yarn is carried out at the position of the pile yarn grippers or intermediate holders.

[0013] In the context of the present patent, the expression "of the same type" is to be understood as meaning: a pile yarn having the same colour, effect and/or appearance.

[0014] This method offers the advantage that the weaving machine does not have to be stopped immediately when the machine detects that a pile yarn is missing in, for example, a specific pile yarn gripper or intermediate holder, the absence of which yarn in the fabric is not acceptable.

By selecting the same (yam) type at another selectable position (on the same pile yarn carrier or on a different pile yarn carrier), there is a good chance of still achieving the incorporation of this desired pile yarn into the fabric so that the weaving machine can continue to form the fabric. As a result, the time between two machine standstills due to pile being missing in the gripper or in the intermediate holder can be significantly increased.

[0015] With a preferred method according to the present invention, the pile yarn is of the same type as that which is supplied to the same pile yarn carrier at two selectable positions originating from a different pile yarn supply. To this end, the Axminster weaving machine preferably comprises a pile yarn supply device which contains the required pile yarn supplies for each pile yarn type (bobbins, spools, etc.), which are each associated with a selectable position of a pile yarn carrier so that each pile yarn type can be presented to the pile yarn grippers or intermediate holders which are required according to the weaving pattern.

[0016] In a more preferred method according to the present invention, the positions of the pile yarn carriers with missing pile yarns are indicated by visual means when the weaving device has come to a standstill. In particular, the positions of the pile yarn carriers with missing pile yarns are indicated by visual means by moving all the pile yarn carriers backwards and then moving forward one by one those pile yarn carriers in which certain pile yarns can no longer be selected.

[0017] In accordance with a particular method according to the invention, after detection of the absence of the pile yarn in a first selectable position, the pile yarn carrier presents this pile yarn again within the same weaving cycle from the second selectable position. Preferably, after a missing pile yarn has been detected at the first selectable position, the pile yarn is again selected first at the first selectable position during the next weaving cycle in which the same pile yarn is to be selected by the same pile yarn carrier.

[0018] With another preferred method according to the invention, after the missing pile yarn has been detected in a first selectable position, the pile yarn carrier carries out the changeover from the first to the second selectable position during the next selection.

[0019] With a most preferred method according to the present invention, the selection of a pile yarn at the first or second selectable position can be excluded from further selection in accordance with a specific algorithm as a function of the number of detected missing pile yarns at the respective positions.

[0020] Another subject of this patent application relates to a device for limiting standstills in a weaving device of the Axminster type, comprising one or more driven pile yarn carriers for selecting one or more pile yarns in accordance with a pattern to be woven, which, in a selected position, are presented directly or via an intermediate holder to grippers driven by an oscillating gripper bar and provided to insert the selected pile yarn into the fabric by rotation of the gripper bar, in which said weaving device furthermore comprises a detection device for detecting missing pile yarns, the device comprising means which are provided to present at least one pile yarn of the same type from a first and at least one second selectable position in at least one pile yarn carrier, so that, after the absence of this pile yarn at the first selectable position has been detected, the pile yarn carrier is provided to present this pile yarn from the second selectable position. Such a device makes it possible to produce fabrics in a much more efficient way as the number of machine standstills is limited.

[0021] With a preferred device according to the invention, said means comprise a control unit which receives input signals and data relating to the missing pile yarn, the control unit processing these data to give a result in accordance with a preset or presettable algorithm and, based on this result, being able to give an output signal to stop the device. In particular, the control unit stores the input signals and data in a file.

[0022] In a more preferred embodiment of the device according to the present invention, the device is provided to carry out the above-described method.

[0023] In order to explain the features of the present invention further and to describe additional advantages and features thereof, a more detailed description of the method used and the device for limiting standstills in a weaving device of the Axminster type is given below. It will be clear that nothing in the following description can

be interpreted as forming a limitation of the protection claimed for the present invention.

[0024] The present invention relates to a method used in a weaving device of the Axminster type for limiting standstills on such weaving devices, comprising one or more driven pile yarn carriers for selecting one or more pile yarns in accordance with a pattern to be woven, which, in a selected position, are presented directly or via an intermediate holder to grippers driven by an oscillating gripper bar and provided to insert the selected pile yarn into the fabric by rotation of the gripper bar, in which said weaving device furthermore comprises a detection device for detecting missing pile yarns. The method according to the present invention is characterized by the fact that, in at least one pile yarn carrier, at least one pile yarn of the same type is presented at a first and at least one second selectable position and that, following detection of the absence of this pile yarn after selection at the first selectable position, the pile yarn carrier furthermore presents this pile yarn from the second selectable position. Preferably, detection of the absence of a pile yarn is carried out at the position of the pile yarn grippers or intermediate holders.

[0025] The Axminster weaving machine furthermore comprises a pile yarn supply device which contains the required pile yarn supplies (bobbins, spools, etc.) for each pile yarn type, which are each associated with a selectable position of a pile yarn carrier so that each pile yarn type can be presented to the pile yarn grippers or intermediate holders which are required according to the weaving pattern.

[0026] In order to carry out the method according to the present invention, the device comprises means which are provided to present at least one pile yarn of the same type from a first and at least one second selectable position in at least one pile yarn carrier, so that, after the absence of this pile yarn at the first selectable position has been detected, the pile yarn carrier is provided to present this pile yarn from the second selectable position.

[0027] The method according to the present invention has the advantage that the weaving device does not have to be stopped immediately when the device detects that a pile yarn is missing in, for example, a specific pile yarn gripper or intermediate holder, the absence of which yarn in the fabric is not acceptable.

By selecting the same (yam) type at another selectable position (on the same pile yarn carrier and this may, in principle, also be a different pile yarn carrier if two pile yarn carriers can serve the same position in an intermediate holder), there is a good chance of still achieving the incorporation of this desired pile yarn into the fabric so that the weaving machine can continue to form the fabric. Only when all the pile yarn supplies of a certain yarn type in a certain pile yarn carrier which are supplied to this pile yarn carrier are detected as being missing for a pile yarn whose absence in the fabric is not acceptable in that location, will the control unit emit a signal which brings the weaving machine to a standstill.

[0028] It may be assumed that when several pile yarn types on several pile yarn carrier systems are presented at several selectable positions, missing pile yarns will usually also be detected on pile yarn grippers or intermediate holders served by other pile yarn carrier systems or missing pile yarns of another yarn type are detected on the same pile yarn carrier before being detected as missing in all selectable positions of that pile yarn type in the same pile yarn carrier.

This means that, compared to the prior art, the time between two machine standstills as a result of missing pile in the gripper or in the intermediate holder can be increased by a significant fraction (factor 5, 10, 20 or more). The duration of the standstill after such a prolonged period will be significantly shorter than the sum of the standstills which would have occurred with the same number of fabric lines to be woven in the prior art method, as the operator now only has to carry out the following steps once:

- notice the standstill;
- interrupt or end the task which he is carrying out at that point in time;
- investigate why the weaving device has come to a standstill;
- restart the device after sorting out all the detected missing pile yarns;

He does, however, need to investigate for all the detected missing pile yarns on which pile yarn gripper or intermediate holder missing pile was detected, find the associated pile yarn carrier and rectify the fault.

[0029] As he, due to the method according to the present invention, will now be able to carry out these activities for several detected missing pile yarns in a grouped manner, this will be more efficient than if this is carried out separately, as is the case in the prior art with each standstill being the result of detection of the missing pile yarn.

[0030] After a standstill of the weaving device, for example due to missing pile yarns, it is possible, by means of the method according to the present invention, to visually indicate the position of the pile yarn carriers with missing pile yarns to the operator. Thus, for example, the machine control unit may move all the pile yarn carriers backwards and then move forward one by one those pile yarn carriers in which certain pile yarn types can no longer be selected in order to visually indicate the defect positions in this manner.

[0031] The method furthermore makes it possible, after a standstill, for example due to a cause which has nothing to do with the poor selection of a pile yarn, for the weaving device to also indicate all selection positions in the pile yarn carriers where a missing pile yarn has been detected since the last machine stop, so that these can already be rectified during this standstill. This reduces the number of standstills still further, as more yarn types in certain pile yarn carriers again have more se-

lectable positions at their disposal and the duration of the standstill is reduced at the same time as a result of steps which do not contribute directly to the rectification (e.g. noticing standstill, interrupting or ending task, restarting, etc.) being limited further.

[0032] In addition, the selection of a pile yarn at the first or second selectable position can be excluded from further selection as the weaving device comprises a control unit which receives input signals and data relating to the missing pile yarn (e.g. pile yarn type, pile yarn carrier, pile yarn gripper, position in the intermediate holder, point in time, etc.), in which case the control unit processes these data in accordance with a preset or presettable algorithm to produce a result and, based on this result, is able to emit an output signal to stop the device. Exclusion takes place in accordance with a certain algorithm as a function of the number of detected missing pile yarns at the respective positions (for example a certain number of times per certain number of selections). This prevents the pile yarn carrier from having to make additional movements in each case, for example when the fault which occurs is such that an intervention is required, before the pile yarn carrier can present tuft with this pile yarn again. Exclusion from selection may be carried out both after the first fault detection has occurred, as a result of which an immediate changeover to a next selectable position of the same yarn type takes place (in the same pile yarn carrier or in another pile yarn carrier), and after only, for example, two or three successive wrong selections have taken place, or exclusion from selection may also take place after for example three to five successive selections which have been carried out incorrectly.

This may be effected in the following way, for example:

When it is detected that there is a missing pile yarn of a certain pile yarn type, the device immediately drives the pile yarn carrier to present the same pile yarn type at another selection position. Within this weaving cycle, a changeover to the second selectable (reserve) position of the pile yarn is effected immediately in order to prevent the weaving cycle taking too long and not being finished within the required time.

During the next weaving cycle where the same pile yarn type has to be selected from this pile yarn carrier, it is possible to select the first selectable position again before switching to the second selectable position when detecting missing pile yarns, as the fault which occurs may be a random fault and the pile yarn may be selected correctly at the next selection and detected as being present. In that case, the system will have rectified itself, as it were.

[0033] In another advantageous method, if it is possible for the fabric to have one or several missing pile yarns, when an missing pile yarn is detected, no attempt is made to select the pile yarn of the same type from the second selectable position, but the pile yarn is allowed to be miss-

ing and, at the same, this selection position of this pile yarn type is excluded from further selection, so that during the next selection of the same pile yarn type using this pile yarn carrier, the pile yarn from the second selectable position is selected and the risk of successive pile yarns being missing will quickly become small, while this risk could have been great if no second selectable position had been present. As a result, the number of standstills of the weaving device is also reduced and the time between two standstills increased, which increases the efficiency and the output of the weaving device.

[0034] In a further advantageous variant, the acceptance or non-acceptance of the absence of a pile yarn may be dependent on the fabric pattern. The algorithm which the control unit uses to determine whether to emit a signal for a machine stop then takes into account the information which is sent along with the drive file for the jacquard device. Thus, in zones with many pile yarns of the same type, more missing pile yarns of this type can be allowed than is the case for pile yarns of a type which is used in the respective zone for accentuation and is therefore only present in limited numbers.

[0035] Compared to weaving devices using a prior-art method, the consequence of the method according to the present invention is that more pile yarn supply has to be present in the pile yarn supply device of weaving devices using this method.

[0036] Now there are prior-art solutions in which the pile yarn supply device can be reduced to a much smaller number of pile yarn supplies or that the pile yarn supply of the individual pile yarn types can be reduced so that the volume per pile yarn type is lowered and thus less space is required for the pile yarn supply device (e.g. weaving creel) and less expensive raw materials are being used.

[0037] Thus, it is known to store very compact supplies of pile yarns behind the weaving device and to replenish these using a robot which, for each yarn type, replenishes all supplies of this yarn type from a large bobbin. Another way is to provide certain devices which, in each weaving cycle, supply several tuft intermediate holders with the yarn types as determined in the weaving pattern and in which the pile yarn grippers pick up the pile tufts, each from one tuft intermediate holder.

[0038] Each of the abovementioned solutions reduces either the space for the yarn supply or certainly the number of bobbins or the amount of pile yarn which has to be available for the weaving process. As none of the abovementioned devices and/or methods describe a solution in which, when the absence of a pile yarn of a certain yarn type is detected, a pile yarn of the correct type can still be picked up without machine standstill, the method (and device) according to the present invention is particularly advantageous with a method or device by means of which the yarn supply (the weaving creel) is reduced, as such methods and devices had just been developed in order to limit the immense yarn supplies which are required when a standard-size bobbin (2 to 5

kg) is present for each pile yarn gripper. To double or multiply the yarn supply in such yarn supply devices for some or all pile yarn types may result in excessively large yarn supplies which no longer outweigh the advantage of the reduced machine standstills.

By now assigning a part or all of the saving in the yarn supply resulting from the prior-art solutions described above to an additional yarn supply in order to reduce by a half yarn types so as to be able to apply the method according to the invention, the advantages of the invention can be achieved without the drawback of excessively large yarn supplies.

[0039] The invention can furthermore be used very advantageously in weaving devices in which the pile yarn carriers are driven by independent drive means, e.g. electric motors, so that the number of selections can be controlled as a function of the detected pile yarn tufts present. The fewer incorrectly detected selections, the more smoothly the remaining selections within a weaving cycle can be finished.

[0040] If, in addition, the drive mechanism of the remaining movements (gripper bar, weft introduction, reed beat-up, cutting movement, etc.) is driven jointly or separately by an independent motor, the weaving speed (succession of the weaving cycles) can be adjusted as a function of the detected missing pile yarns and the required additional movements of a pile yarn carrier (if a pile yarn carrier has to carry out additional selections, the speed of the weaving machine is reduced).

Claims

1. Method for limiting standstills in a weaving device of the Axminster type, comprising one or more driven pile yarn carriers for selecting one or more pile yarns in accordance with a pattern to be woven, which, in a selected position, are presented directly or via an intermediate holder to grippers driven by an oscillating gripper bar and provided to insert the selected pile yarn into the fabric by rotation of the gripper bar, in which said weaving device furthermore comprises a detection device for detecting missing pile yarns, **characterized in that**, in at least one pile yarn carrier, at least one pile yarn of the same type is presented at a first and at least one second selectable position and that, following detection of the absence of this pile yarn after selection at the first selectable position, the pile yarn carrier furthermore presents this pile yarn from the second selectable position.
2. Method according to Claim 1, **characterized in that** the pile yarn is of the same type as that which is supplied to the same pile yarn carrier at two selectable positions originating from a different pile yarn supply.
3. Method according to Claim 1 or 2, **characterized in**

that the positions of the pile yarn carriers with missing pile yarns are indicated by visual means when the weaving device has come to a standstill.

4. Method according to Claim 3, **characterized in that** the positions of the pile yarn carriers with missing pile yarns are indicated by visual means by moving all the pile yarn carriers backwards and then moving forward one by one those pile yarn carriers in which certain pile yarns can no longer be selected. 5
5. Method according to one of the preceding claims, **characterized in that**, after detection of the absence of the pile yarn in a first selectable position, the pile yarn carrier presents this pile yarn again within the same weaving cycle from the second selectable position. 10
6. Method according to Claim 5, **characterized in that**, after an missing pile yarn has been detected at the first selectable position, the pile yarn is again selected first at the first selectable position during the next weaving cycle in which the same pile yarn is to be selected by the same pile yarn carrier. 15
7. Method according to one of Claims 1 to 4, **characterized in that**, after the missing pile yarn has been detected in a first selectable position, the pile yarn carrier carries out the changeover from the first to the second selectable position during the next selection. 20
8. Method according to one of the preceding claims, **characterized in that** the selection of a pile yarn at the first or second selectable position can be excluded from further selection in accordance with a specific algorithm as a function of the number of detected missing pile yarns at the respective positions. 25
9. Device for limiting standstills in a weaving device of the Axminster type, comprising one or more driven pile yarn carriers for selecting one or more pile yarns in accordance with a pattern to be woven, which, in a selected position, are presented directly or via an intermediate holder to grippers driven by an oscillating gripper bar and provided to insert the selected pile yarn into the fabric by rotation of the gripper bar, in which said weaving device furthermore comprises a detection device for detecting missing pile yarns, **characterized in that** the device comprises means which are provided to present at least one pile yarn of the same type from a first and at least one second selectable position in at least one pile yarn carrier, so that, after the absence of this pile yarn at the first selectable position has been detected, the pile yarn carrier is provided to present this pile yarn from the second selectable position. 30

10. Device according to Claim 9, **characterized in that** said means comprise a control unit which receives input signals and data relating to the missing pile yarn, the control unit processing these data to give a result in accordance with a preset or presettable algorithm and, based on this result, being able to give an output signal to stop the device. 35

11. Device according to Claim 10, **characterized in that** the control unit stores the input signals and data in a file. 40

12. Device according to Claims 9 to 11, **characterized in that** the device is provided to carry out a method according to Claims 1 to 8. 45



European Patent
Office

EUROPEAN SEARCH REPORT

Application Number
EP 08 10 2581

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
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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 4 June 2008	Examiner Pussemier, Bart
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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EPO FORM 1503 03.82 (P04C01)

**ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.**

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This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.
The members are as contained in the European Patent Office EDP file on
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