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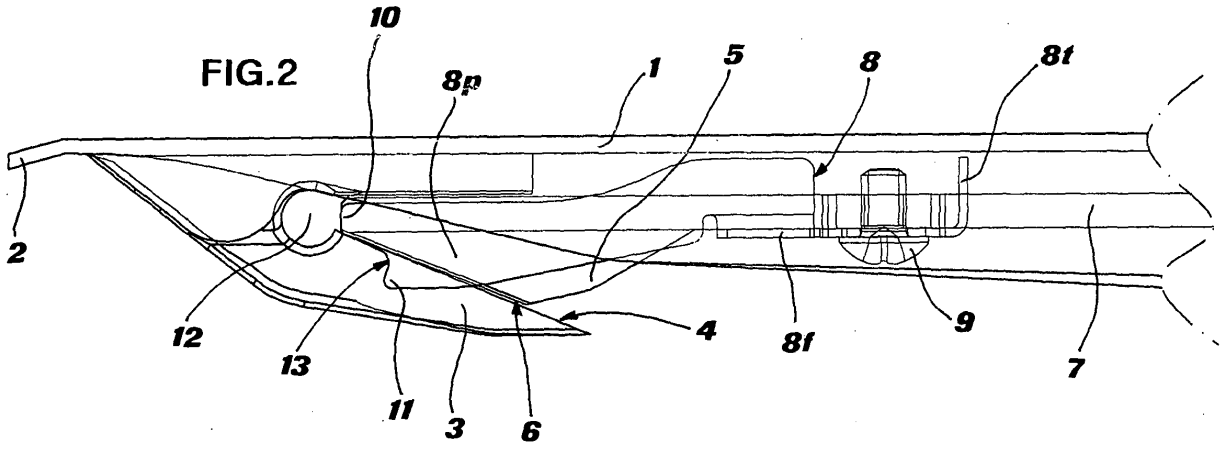
(54) Drawing gripper for weaving looms with improved performance for the transport of double weft yarns

(57) Drawing gripper for weaving looms comprising a gripping device of the weft thread consisting of the coupling between a fixed surface formed in the inner part of the gripper hook and inclined with respect to the shifting direction of the gripper, and the mobile surface of a wedge carried on the front end of a longitudinal rod housed in the gripper and movable in an axial direction with respect thereto. The movable rod is driven in an open position of the gripping device, in contrast with spring means provided on the gripper, by lever means cooperating with fixed outer abutments arranged on the loom, and on the same rod the rear portion of a flexible metal plate is attached, the free front portion whereof imparts an elastic pressure force to the upper edge of at least one of the cooperating surfaces of said gripping device.

FIG.2



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Description

[0001] The present invention refers to a drawing gripper for weaving looms specifically designed to achieve a steady grip of double weft threads, i.e. consisting of two individual weft yarns which are associated and introduced simultaneously in the shed formed of warp threads to manufacture special fabrics.

[0002] In gripper looms, weft transportation across the shed is, as known, accomplished by a pair of cooperating grippers, called carrying gripper and drawing gripper, respectively, which are controlled in an alternate movement through the shed. More precisely, the path of the carrying gripper unfolds between the weft entry side and the middle of the shed, whereas the one of the drawing gripper unfolds, correspondingly, between the weft output side and the middle of the shed.

[0003] In the middle of the shed a weft thread exchange hence occurs between the carrying gripper, which has carried it there, and the drawing gripper, which, after having picked up the weft thread from the carrying gripper, carries it to the weft output side of the loom. Both grippers are therefore equipped with weft thread gripping devices generally consisting of a pair of surfaces, one of which is fixed and the other is mobile, kept in contact by elastic retention means with a predetermined pressure force.

[0004] During the initial weft thread gripping by the carrying gripper and during the subsequent exchange of said thread with the drawing gripper, the weft thread is picked up within the gripping means by the gripper (carrying and drawing gripper, respectively) in a closed position, thanks to the combination of forces originating from the translation movement of the grippers and from the resistance imparted by the weft thread which is optimally taut on the path of the grippers. Particularly sensitive from this point of view is the weft exchange which occurs between the pair of carrying/drawing grippers in the middle of the shed; as a matter of fact, unlike the initial weft thread gripping operation by the carrying gripper, wherein the thread is stationary in a predetermined fixed position and especially free from any impediment, in the case of the weft exchange the weft thread is not only obviously moving, but it is also steadily retained by the gripping means of the carrying gripper. The gripping of the weft thread by the drawing gripper must hence be sufficiently swift and stable, on both the yarns making up the double weft thread, so as to free the weft thread from the gripping means of the carrying gripper without causing harmful mutual sliding of the two yarns forming the same.

[0005] The double weft threads are used for the formation of fabrics having special technical or aesthetic features, such as for example those intended for soft furnishings or sportswear. In order to manufacture this type of fabrics, in many cases the two weft threads have remarkably different features, in particular as far as their count is concerned; the association between a bulky yarn apt to give the fabric particular aesthetic features and thin, high-resistance yarns which instead give the fabric the necessary stability from a mechanical point of view is common for example.

[0006] For this reason the weft exchange operation between the carrying gripper and the drawing gripper is particularly critical when double weft threads are used. As a matter of fact, it is not infrequent for the gripping device of the drawing gripper to steadily tighten only the weft thread having the higher count, while the thinner weft thread is not suitably retained, so that the tension imparted to the two weft threads is different, causing weaving irregularities due to the partial mutual sliding of the two threads or even to the complete breakage of either of them.

[0007] It is hence an object of the present invention to supply a drawing gripper for weaving looms which is particularly suited to the transportation of double weft threads, capable of guaranteeing a secure and reliable gripping of both threads, regardless of the differences in the count or in other features which there may be between the same.

[0008] According to the present invention, such object is achieved by means of a drawing gripper for weaving looms, of the type wherein the weft thread gripping device consists of the coupling between a fixed surface formed in the inner part of the gripper hook and inclined with respect to the shifting direction of the gripper, and the mobile surface of a wedge carried on the front end of a longitudinal rod housed in the gripper and movable in an axial direction with respect thereto, said rod being driven in an open position of the gripping device, in contrast with spring means provided on the gripper, by lever means cooperating with fixed outer abutments arranged on the loom, characterised in that it further comprises a flexible metal plate arranged, with a free front portion thereof, in contact with the upper edge of at least one of the cooperating surfaces of said gripping device, and apt to impart an elastic pressure force thereon.

[0009] Further features and advantages of the drawing gripper according to the present invention will in any case be more evident from the following detailed description of a preferred embodiment of the same, illustrated with reference to the accompanying drawings, wherein:

fig. 1 is an elevation side view of the front portion of a drawing gripper according to the present invention, with the gripping device in a closed position;

fig. 2 is a top plan view of the same gripper portion shown in fig. 1;

fig. 3 is a view similar to fig. 2, wherefrom the flexible metal plate subject of the present invention has been removed and the gripping device is in an open position; and

fig. 4 is a perspective view of the gripper portion shown in fig. 1.

[0010] The drawing gripper according to the present invention comprises, in a manner well-known per se to people skilled in the field, a gripper body 1 ending at the

front in a tip 2. Immediately behind gripper tip 2, to the gripper body 1 a hook 3 is attached integrally therewith having a planar gripping surface 4 facing the inside of the gripper. Surface 4 lies on a plane which, in the illustrated embodiment, is substantially vertical and moderately inclined with respect to the longitudinal axis of the gripper, for example by an angle comprised between 15° and 30°.

[0011] The inner surface 4 of hook 3 represents, in known-type drawing grippers, one of the two elements of the weft thread gripping device, the other element consisting of a wedge 5, equipped with a movable gripping surface 6 facing hook 3, and of an opposite surface resting on gripper body 1. Wedge 5 is carried on the front end of a rod 7 movable in a longitudinal direction along gripper body 1, the movement whereof is caused in one direction by spring means (not shown) which elastically push rod 7 towards gripper tip 2 and, in the opposite direction, by a lever (not shown) having its fulcrum on gripper body 1 and apt to cooperate with fixed outer abutments arranged on the loom. When the drawing gripper lies within the shed, the control lever of rod 7 is not operated and the spring means thereby constantly keep gripping surface 6 of wedge 5 in contact with the corresponding gripping surface 4 of hook 3, while the opposite wedge resting surface abuts against the inner wall of gripper body 1, the tightening force between gripping surfaces 4 and 6 being able to be set at will by varying features and preload of the spring means. When the gripper lies outside the shed, the control lever of rod 7 is operated by the fixed abutment means on the loom, by moving the rod in contrast with the action of the above-said spring means and thereby opening the gripping device of the gripper.

[0012] The gripping surface 6 of wedge 5 also consists of a plane surface arranged according to a vertical plane, however having an inclination angle to the longitudinal axis of the gripper slightly smaller than that of surface 4. Thereby, the two surfaces come into contact only in the front area thereof leaving an empty channel having a width increasing towards the rear part of the gripper, which channel the weft thread enters upon exchange with the carrying gripper.

[0013] From the preceding description the nature of the drawback which the present invention intends to solve should appear more clearly. As a matter of fact, when the weft thread consists of a double thread, the yarn between the two which finds its way first into the gripping channel introduces itself between the two gripping surfaces up to the point where the resistance offered is sufficient to cause the detachment of the yarn from the gripping devices of the carrying gripper. The second thread entering the gripping channel - particularly in case the two threads have different counts and said second thread is the smaller-counted one - instead cannot achieve the same resistance with respect to the gripping device because its penetration of the gripping channel is limited by the presence of the first thread and it therefore stops in an area wherein the two surfaces 4 and 6 are still too far away to be able to impart a sufficient gripping effect to the thread, with the consequences already illustrated in the introductory remarks to the present description.

[0014] According to the present invention, such problem is perfectly solved by equipping the gripping device of the drawing gripper with a third gripping element, in addition to the two above-mentioned surfaces 4 and 6, said third element consisting of a metal plate 8 which closes upwardly the gripping channel formed between surfaces 4 and 6, elastically resting on at least one portion of the upper edge of hook 3 or of wedge 5. In order to increase the contact surface and the resulting gripping action, hook 3 and wedge 5 preferably have their upper surfaces formed so as to lie on a single, substantially horizontal plane, whereon the free front portion of plate 8 hence rests.

[0015] Thanks to the presence of flexible plate 8, when the two yarns of the double weft thread enter the gripping channel formed between surfaces 4 and 6, and before reaching the area of said channel wherein the gripping action begins, they meet the edge of plate 8 and are thereby deviated to under the same plate. The retaining action of the two yarns is hence played both by the elastic gripping action between surfaces 4 and 6, and by the elastic gripping action between plate 8 and the underlying upper surfaces of hook 3 and possibly also of wedge 5. This second gripping action allows to integrate as necessary the gripping action offered by the cooperation between hook 3 and wedge 5, in order to steadily retain also the one, between the two yarns making up the double weft, which has entered second the gripping channel and which would consequently suffer from insufficient gripping.

[0016] The intensity of the elastic retaining action played by flexible plate 8 can be predetermined at will according to the material, form and thickness features of the same plate, as well as to the corresponding attachment system, according to different possible ways, all well-known to people skilled in the field and hence included in the scope of the present invention. One of the various possible embodiments of flexible plate 8 is shown in the drawings and will be described in the following.

[0017] According to such embodiment, plate 8 comprises, in addition to operative front portion 8p already described above, lying in a substantially horizontal position, a vertical rear portion 8f laterally adjacent to rod 7 and fastened to the same by means of a screw 9. On the opposite side of screw 9, with respect to portion 8p, plate 8 finally has a short extension 8t, perpendicular to portion 8f and preferably lying in the same plane as portion 8p, said portion 8t having a thickness and a length such as to lie in contact with the upper side of rod 7 along the entire width thereof. The combined action of screw 9 and of extension 8t hence represents a simple and effective constraint, with no degree of freedom, of the rear portion of plate 8, so that the front and operative portion of the

same is movable only thanks to the elastic properties of the material making up plate 8 and of the shape thereof.

[0018] The desired preload level of operative portion 8b of plate 8, i.e. the elastic force imparted thereby on the plane formed by hook 3 and by wedge 5, is determined by the geometric conformation of the plate and, in particular, by the thickness and by the free length of portion 8p. By replacing the plate with one having different features, it is hence possible to quickly and simply adapt the gripper to the use with yarns having a different count or a different degree of smoothness.

[0019] According to an important feature of the invention, the front end of plate 8 has a characteristic, asymmetric fork-shape, clearly visible in figs. 2 and 4, comprising a longer inner prong 10 and a shorter outer prong 11. Prong 10 hence extends mainly above wedge 5 and on the front part of the edge of hook 3, up to near sliding groove 12 of the weft thread, while prong 11 extends instead mainly on the central portion of the upper surface of hook 3. The two prongs 10 and 11 are finally mutually connected so as to form a slight depression or concavity 13, the edge joining said depression to the tip of prong 10 being substantially parallel to the underlying gripping channel.

[0020] This particular shape of the front end of plate 8 has been designed to guarantee the maintenance of a secure gripping of the weft thread also in the particular dynamic conditions in which the weft exchange takes place. At the moment of the exchange, as a matter of fact, the double weft thread - taut within the carrying gripper - is captured by hook 3 and led into the gripping channel formed between the opposing gripping surfaces 4 and 6, as already said above. During this step the weft thread - still retained by the gripping means of the carrying gripper - slides along the outer edge of prong 11, overcoming the tip thereof, until it places itself in correspondence of depression 13. At the end of the exchange, which occurs at a relatively low speed, the drawing gripper then undergoes a fast acceleration beginning the return path to its starting position outside the shed, and it is precisely in this step that the particular asymmetric fork-shape of the end of plate 8 plays its role. As a matter of fact, the sharp acceleration of the gripper may cause a whip-effect on the weft thread which is projected in the direction of advancement of the gripper, overcoming the gripper and originating loops.

[0021] In this case the weft thread hence momentarily undergoes a force facing the output direction of the gripping channel, which force can hence cause the disengagement of the one weft thread, between the two, which is retained only or mainly by the action of plate 8. The presence of the tip of prong 11, projecting forwards with respect to the bottom of depression 13, hinders instead such disengagement, guaranteeing a perfectly secure gripping of both the yarns of the double weft thread also in the presence of dynamic loop formation, as described above.

[0022] The drawing gripper according to the present invention has been described with reference to a preferred embodiment thereof, but it is clear that a number of changes and variants can be made thereto, particularly concerning the shape and the attachment system of plate 8 or the conformation of the free end thereof, which are all within easy reach of a person skilled in the field and hence fall within the scope of the present invention, as defined in the accompanying claims.

Claims

1. Drawing gripper for weaving looms, of the type wherein the weft thread gripping device consists of the coupling between a fixed surface formed in the inner part of the gripper hook and inclined with respect to the shifting direction of the gripper, and the mobile surface of a wedge carried on the front end of a longitudinal rod housed in the gripper and movable in an axial direction with respect thereto, said rod being driven in an open position of the gripping device, in contrast with spring means provided on the gripper, by lever means cooperating with fixed outer abutments arranged on the loom, **characterised in that** it further comprises a flexible metal plate arranged, with a free front portion thereof, in contact with the upper edge of at least one of the cooperating surfaces of said gripping device, and apt to impart an elastic pressure force thereon.

2. Drawing gripper as claimed in claim 1), wherein said metal plate is fixed, with no degree of freedom, only in correspondence of a rear portion thereof.

3. Drawing gripper as claimed in claim 2), wherein said metal plate is joined to said mobile rod.

4. Drawing gripper as claimed in claim 3), wherein the upper surfaces of the hook and of the wedge are aligned on a single horizontal plane whereon the free front portion of said flexible plate rests.

5. Drawing gripper as claimed in claim 4), wherein the rear portion of said flexible plate comprises a substantially vertical wall attached by way of screw means to the side wall of said mobile rod.

6. Drawing gripper as claimed in claim 5), wherein said screw means consists of a single screw housed in a hole of said vertical wall and said rear portion of the flexible plate further comprises a horizontal extension, lying on the upper surface of said mobile rod.

7. Drawing gripper as claimed in claim 3), wherein said flexible plate has a front end formed as an asymmetric fork comprising a longer inner prong and a shorter outer prong, said prongs being mutually connected by a moderate intermediate concavity.

8. Drawing gripper as claimed in claim 7), wherein the inner prong of the asymmetric fork extends mainly on said wedge and on the front part of the edge of said hook, up to near the sliding groove of the weft thread, while the outer prong of the asymmetric fork extends mainly on the middle portion of the hook.

9. Drawing gripper as claimed in claim 7), wherein the edge of said plate, in the area comprised between the tip of the inner prong and said concavity is substantially parallel to the gripping channel.

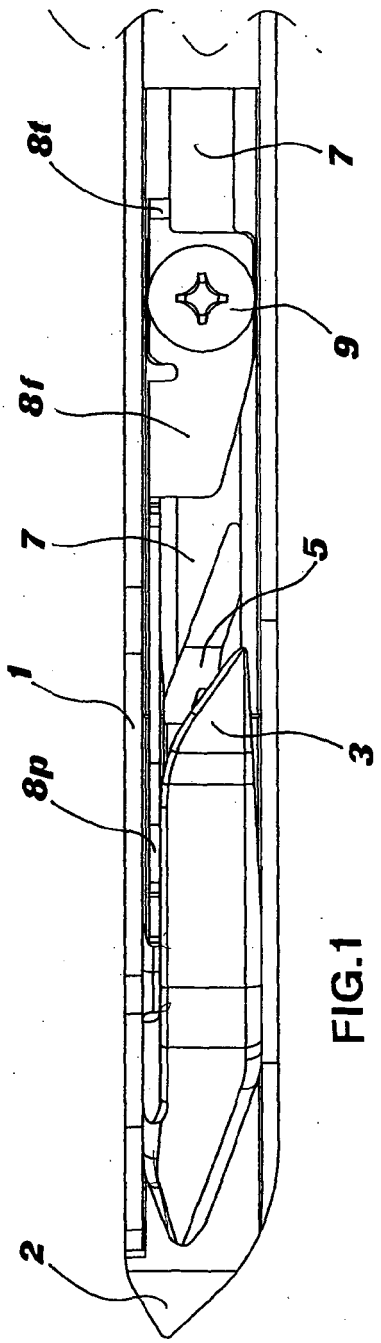

FIG.1

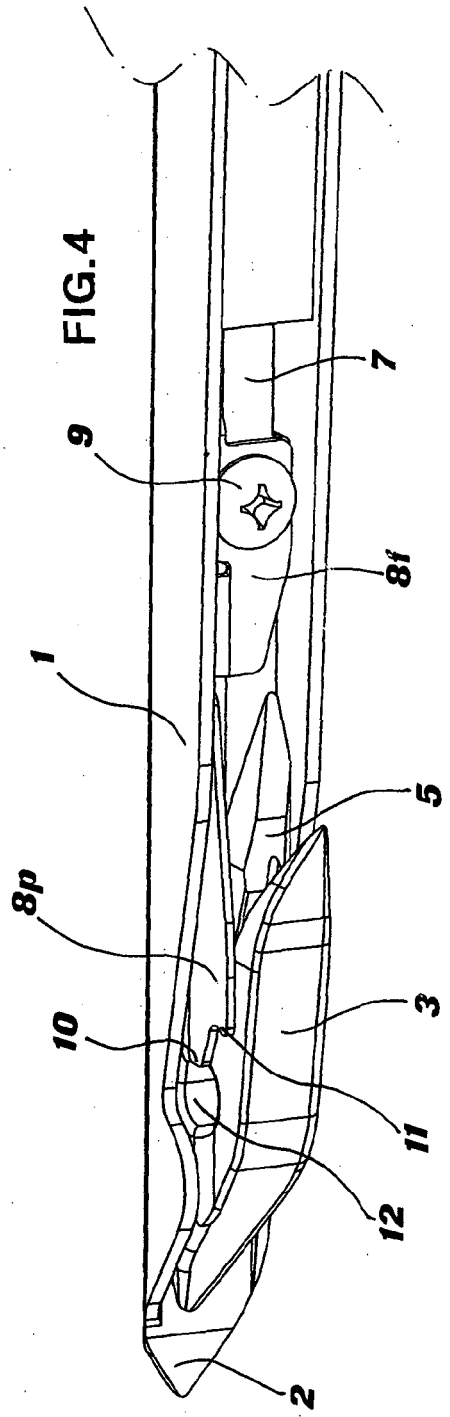

FIG.4

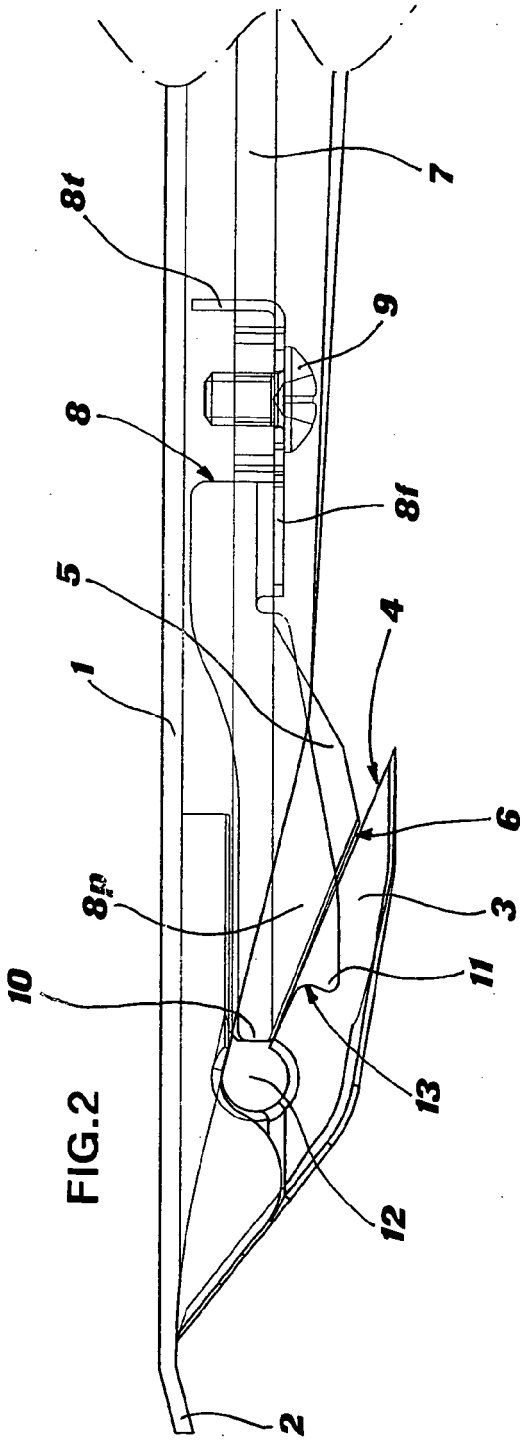

FIG.2

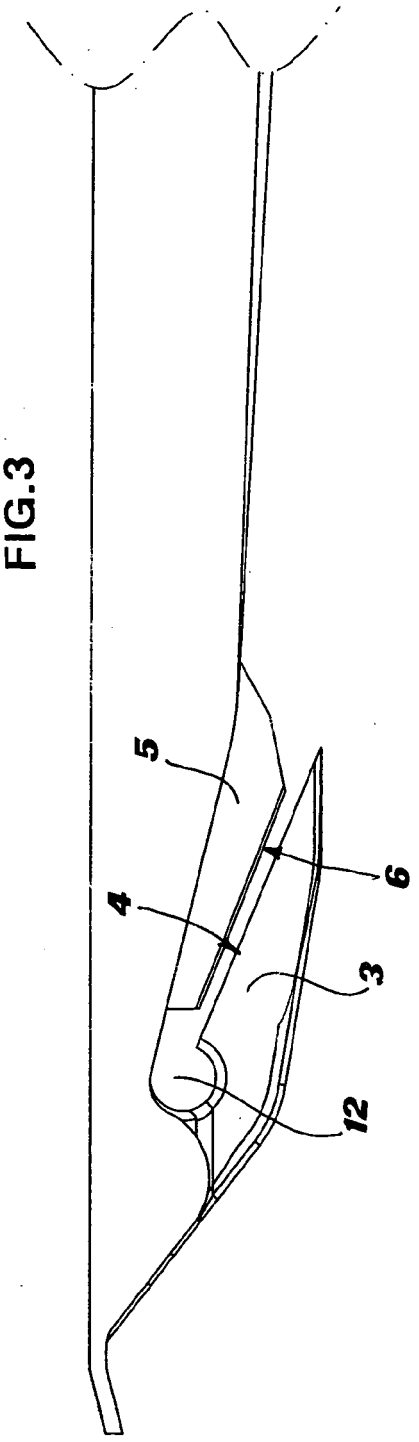

FIG.3

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Application Number
EP 05 42 5929

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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	16 October 2006	Pussemier, Bart

CATEGORY OF CITED DOCUMENTS

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