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(54) METHOD FOR MANUFACTURING A REED FOR WEAVING LOOMS AND REED OBTAINED WITH SUCH METHOD

(57) Method for manufacturing a reed for weaving looms comprising:
a. a first step wherein individual blades (L) intended to form the reed dents are assembled in succession, side by side, parallel to a predefined lying plane and equally spaced apart, in a temporary support structure consisting of longitudinal rods (2), while interposing gauged spacing yarns (F) between each adjacent pair of blades (L); and
b. a second step wherein the free ends of the blade (L) assembly assembled in said temporary support structure are inserted and locked in support crosspieces (T);

The temporary support structure used in the initial assembling step of blades (L) comprises at least three longitudinal rods (2), arranged along the reed height and alternately offset on one side and on the other of said reed, and the spacing yarns (F) interposed between adjacent blades (L) consist of lengths of spacing yarn (F), arranged against the lateral surface of said blades (L) and having a wavy conformation resting on said rods (2) .

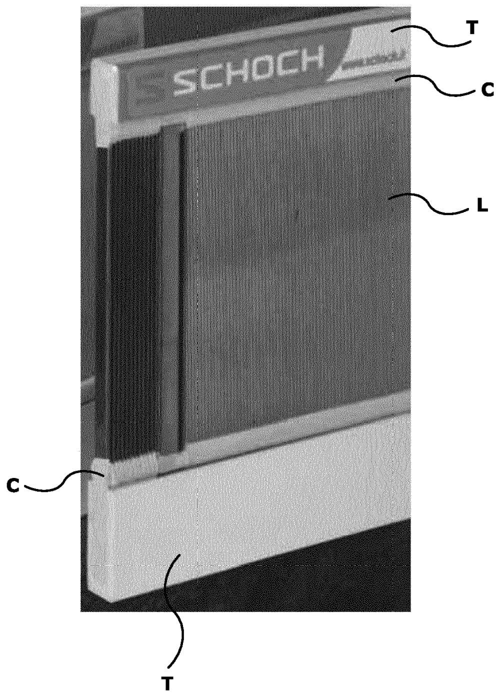

FIG. 1

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Description

FIELD OF THE INVENTION

[0001] The present invention relates to reeds for weaving looms, and more particularly, to a method for manufacturing said reeds.

BACKGROUND ART

[0002] Since ancient times, it is well known that the technique for manufacturing reeds for weaving looms involves using multiple blades which are fixed on a rigid support, arranged side by side and parallel to a predefined lying plane, , at a predetermined, usually constant, mutual distance.

[0003] Said blades, which in the current practice are also called "dents" of the reed (hereinafter in the present description, either the terms "blade" or "dent" will be used indifferently), have a substantially rectangular cross section - except in the case of blades for air-loom reeds, which will be referred to below - whose larger side, hereinafter referred to as "depth", generally is from 2 to 16 mm in size, and whose smaller side, hereinafter referred to as "thickness", generally is from 0.01 to 2.00 mm in size.

[0004] For manufacturing a reed, single blades are currently expected to be fixed in succession, one by one, on two substantially identical metal rods, a lower rod and upper rod relatively to the normal working position of the reed. More precisely, each of the aforementioned rods is currently formed by a pair of opposed metal shaped bars between which the blades of the reed are positioned, said shaped bars having a flat profile at the side in contact with the blades and a rounded profile at the other side (i.e., in practice, a circular segment cross-section), such that, taking into account the spacing imposed by the blades, the assembly of two opposed shaped bars forms a roughly circular cross-section.

[0005] On this circular cross-section a blade spacing yarn is wound, either manually according to the oldest technique or through a mechanical winder according to the current technique. Usually, said spacing yarn consists of a metal yarn; it is essential that said spacing yarn have a cross-section diameter as uniform as possible.

[0006] More precisely, with such a spacing yarn a coil is formed around each of the two rods formed by a pair of opposed section bars; then a new reed blade is inserted, by pushing and tightening it with a suitable abutting member against the newly wound coil, thus forming another successive coil and so on, each time alternating a coil of spacing yarn with a blade, until the expected length of the reed is completed. This operation is of course carried out simultaneously on both reed rods. In addition to determining the correct spacing of the reed blades and their parallelism to a predefined lying plane, the winding of the spacing yarn coils also allows for a sufficient temporary retention of the blades on the rods, owing to the fact that the winding of the spacing yarn coils is accomplished by keeping the yarn at a moderate tension to achieve a good regularity of the coils; this causes the two shaped bars to be mutually tightened against the blades interposed therebetween and therefore causes the blades to remain correctly locked in place until the final construction step of the reed.

[0007] Of course, between each pair of adjacent blades, there can be alternated not just one coil of spacing yarn, but also two or more adjacent coils; the number of coils and the thickness of the spacing yarn precisely determining the distance between the blades intended to form the dents of the finished reed and therefore their parallelism. This distance should in fact be absolutely accurate, along the length of the reed, so that the resulting fabric be then perfectly regular, i.e., without any weaving marks.

[0008] As it can be easily understood, in order to manufacture the reed with the method described above, the reed blades should be arranged with their depth direction perpendicular to the axes of the rods; however, considering that, as stated above, the shaped bars forming the rods are tightly locked against said blades by the spacing yarn, in order to easily accomplish the insertion of the new blades, these are normally inserted between the pairs of shaped bars in a tilted position, i.e., with their depth side suitably tilted, for example at ± 45°, or even parallel to the shaped bars in case of shaped bars for air looms, and then rotated at the angle required to arrange said depth side in its final inclination, i.e., perpendicular to the shaped bars and parallel to the predefined blade lying plane, before pushing and tightening them against the previously assembled blades or, more precisely, against the spacing yarn coils wound on the last assembled blade, in the reed being formed.

[0009] This blade assembling process starts at one end of the rods and continues, one blade after the other and always alternating the blades with the coils of spacing yarn, up to the opposite end of the rods. As already mentioned above, these rods are each comprised of two pairs of shaped bars, which thus have, already at the beginning of the process, the desired final length of the reed (therefore even up to 4-6 meters) . The rods are naturally arranged parallel, appropriately locked to a supporting structure at their opposite ends, and mutually spaced apart by a distance substantially corresponding to the desired height of the finished reed. The reed is usually assembled, for greater operating convenience, with the two rods being arranged in a horizontal plane so that the new blades inserted rest on the shaped bars below, in a stable equilibrium position.

[0010] Consequently, in the known assembly method described above, assembly operations must be performed at the same time both at the lower and the upper rods, since each blade should be spaced with one or more coils of spacing yarn on both rods. Therefore, in a mechanically operated assembly method, there is provided not only a winding unit for each one of said rods, but also a trolley device which, by moving parallelly to the rods, carries an abutting member integral thereto in order to push each inserted blade and the respective spacing yarn coils previously wound on the lower and upper rods, tightening the whole against the previously assembled and tightened blades. In an alternative arrangement, also known in the prior art, the abutting member is steady while the supporting structure carrying the rods is moved according to an alternate rectilinear motion, in order to successively bring the newly inserted blade against the steady abutting member, thereby tightening the same.

[0011] Upon completion of the assembly process, i.e., when all the blades have been inserted and tightened on the two rods, thus already forming a temporarily stable structure, such a structure is completed by locking the end portions of the shaped bars protruding outside the rods, for example by impregnating the same with a suitable thermosetting resin inside suitable U-shaped sections made of metallic or plastic materials; said U-shaped sections obviously having the same length as the rods.

[0012] This manufacturing method and the resulting reed structure have long been widely known; however, they are not free from drawbacks, especially when reeds with a very dense structure need to be made. Indeed, it is well known that in the last 20 years the yarn counts for the textile industry have become more and more small in diameter, and therefore require increasingly finer reeds and consequently thinner blades, in the order of hundredths of a millimeter in thickness, to be used in weaving looms. At the same time, the same production machines, i.e. the weaving looms, produce at increasingly higher speeds, ranging from 650 strokes per minute for the "flat reeds" of gripper looms to almost twice this speed for the "airjet reeds" of air looms. In modern reeds, therefore, a particularly critical combination of factors frequently occurs, i.e., on the one hand the use of increasingly thinner materials for reed manufacturing and, on the other hand, the use of said reeds at increasingly higher working speeds.

[0013] The most critical point of this combination of factors is the dynamic behavior of thousands of very thin "dents" alternately moving at high speeds and, in particular, the risk that in such conditions, blade vibration phenomena are triggered that cause an unstable spatial position of the blades, resulting in deterioration of the reed performance and quality impairment of the final fabric produced with the same. Other conditions being equal, the dynamic behavior of the reed's dents is moreover strongly affected by the residual stresses that may be applied to the blades by the above-described blade spacing and retention system. Such stresses may in fact both directly altering the perfect parallelism of the blades, and trigger the aforementioned blade vibration phenomena, thus causing defects in the fabric. Finally, considering that, in the aforementioned prior art, an accurate spacing of the blades is only provided at the opposite ends of the same, it is obvious that the above described drawbacks are increasingly shown when the reed height increases.

[0014] Another drawback of the reed manufacturing method according to the above-described prior art lies in the fact that, although partly automated, such methods still require a high degree of manual skill and experience of the operator, especially in the initial machine assembly step, in controlling the even working of the machine during reed manufacturing, and in the final quality check of the reed thus obtained. It happens indeed with some frequency that, despite any attention of the operator during the assembly step, there remain not acceptable stresses in the blades; in this case, the blade spacing should be resumed in an entirely manual manner, before the final impregnation step of the opposed ends of the blades, by replacing the aforementioned rods with gauged-thickness helical springs which are inserted under pressure between the single dents of the already formed reed, while removing the rods and relative spacing yarn formerly used.

[0015] The above described reed manufacturing method also has a low throughput, since the step of forming the coils of spacing yarn, in addition to be a slow process *per se,* also occurs discontinuously, as it is necessarily alternated with the blade insertion and blade tightening steps performed by the abutting member. The whole manufacturing methods can therefore only be performed at low speeds.

PROBLEM AND SOLUTION

[0016] The underlying problem of the invention is therefore to provide a new blade assembly method for forming a reed structure for weaving looms, and a new reed structure thus obtained, which overcome the aforementioned drawbacks.

[0017] In particular, a main object of the invention is to provide a method for manufacturing loom reeds in which any residual stresses on the blades are completely eliminated.

[0018] Another important object of the invention is to provide a method for manufacturing loom reeds that allows for achieving a very precise blade parallelism, along the whole extension of the blades, independently of the thickness, and then of the stiffness, of the blades and of the height of the reed.

[0019] A further object of the present invention is to provide a method for manufacturing loom reeds in which the main steps of blade insertion and spacing yarn positioning may overlap at least in part, so as to achieve greater continuity of the manufacturing method and therefore greater productivity thereof.

[0020] Finally, still another important object of the present invention is to achieve a constant quality of the end product, independently of the experience of the manpower employed in its manufacture.

[0021] This problem is solved, and these objects are achieved, by means of a method for manufacturing weaving loom reeds having the features defined in claim 1 and by means of a loom reed having the features defined in claim 15. Other preferred features of the invention are defined in the attached dependent claims.

BRIEF DESCRIPTION OF THE DRAWINGS

[0022] Further features and advantages of the invention will in any case be better understood from the following detailed description of some preferred embodiments, which are given solely by way of non-limiting examples and are shown in the attached drawings, in which:

Fig. 1 is a perspective view of one of the ends of a straight blade reed of the prior art, for projectile-, gripper- and water- weaving looms;
Fig. 2 is a view similar to that of Fig. 1, regarding a shaped blade reed of the prior art, for air weaving looms;
Fig. 3 is a schematic front view of the assembly structure of a straight blade reed according to the method of the present invention;
Fig. 4 is a schematic side view of the assembly structure of Fig. 3 according to arrow IV of this figure, in which the wavy configuration of a length of a spacing yarn, along the entire height of the blades, is shown;
Fig. 5A is a schematic side view of the assembly structure of Fig. 3, according to arrow V of this figure;
Fig. 5B is a view similar to Fig. 5A, in a first embodiment of the method of the present invention, in which an elastic bending of the rods is performed, in an intermediate position thereof, for the insertion of a spacing yarn in a shed thus formed between the rods; and
Fig. 5C is a view similar to Fig. 5A, in a first embodiment of the method of the present invention, in which an elastic bending of the rods is performed, in an end position thereof, for the insertion of a spacing yarn in a shed thus formed between the rods.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

[0023] Figures 1 and 2 show two reeds of the prior art, with rectilinear blades (Figure 1) for gripper-, projectile- and water-looms, and shaped blades (Fig. 2) for air looms, respectively. In both cases, the group of blades L is clearly visible, which blades are retained at their lower and upper ends by rods C; the structure of each of these rods - well known in the art and not further shown here - comprises coupling of two opposed shaped bars upon the two sides of the reed. Moreover, as is also well known, the free ends of the blades protruding beyond rods C, as well as one side of said rods, are embedded through impregnation with a suitable thermosetting material into end U-sections forming the horizontal crosspieces T of the loom reed.

[0024] As will become clearer from the detailed description below, the basic principle of the method for manufacturing a reed for weaving looms according to the invention, consists in using, as a spacing member, at least a length of a spacing yarn, running across the blade height and being positioned against the lateral surface of the blade, in a wavy configuration lying in a plane parallel to the lying plane of said blades.

[0025] The term "wavy configuration", referred to the shape of the length of spacing yarn, should be understood herein to comprise any type of sinusoidal, zig-zag, fret-shape, or any other, even irregular shape allowing the length of spacing yarn to cross each blade several times, possibly protruding from its opposite edges, in different points of the same blade, thus creating a much more stable scattered support for the blades, even when these, due to their reduced thickness, are characterized by a high flexibility. According to the present invention, the above described support structure comprising a continuous spacing yarn wound as a spiral on two rods C intended to be permanently incorporated in the reed is in fact abandoned. On the contrary - according to a first basic feature of the invention - a temporary support structure is used wherein the reciprocal spacing of the blades, in order to form gaps S for the passage of the warp yarns having a perfectly constant width, is obtained by means of single lengths of spacing yarn having a suitable gauge. Said spacing yarn is of the same type already in use in the known manufacturing methods and, as already mentioned above, is formed according to a wavy configuration, then laid and tightened on the lateral surface of blades L to make up the spacing member between two successive blades, and finally removed when the manufacturing of the reed is completed.

[0026] Said temporary support structure should therefore simply apt to impart stability and compactness to the reed being formed - consisting of the set of blades L and the lengths of spacing yarn F interposed therebetween - during the reed assembly steps and the subsequent locking of the opposed blade ends into U-section crosspieces T by means of an impregnation resin, and therefore is not particularly limited.

[0027] In a preferred embodiment of the invention, this temporary structure comprises a plurality of rods, e.g. at least three rods, each consisting - instead of a pair of opposed shaped bars as in the prior art - of a single shaped bar. The optimum number of rods is determined according to the thickness of the blades and the height of the reed. Said rods are all arranged either on the same side of the reed or in an alternate manner, on both sides of the blades, as will be better described below. The individual shaped bars forming said rods may have a circular segment cross-section - as in the prior art - or any other convenient section, for example a semicircular, or an elliptical or a perfectly circular cross-section as illustrated by way of example in the drawings. As a matter of fact, since these shaped bars are intended to perform their function autonomously, i.e. without direct cooperation with an opposed shaped bar and are also intended to be removed at the end of processing, as will be better explained below, their cross-section shape is not particularly critical.

[0028] In any case, it is possible to utilize any other embodiment of the temporary support structure - which includes for example trays, bars, or other shaped sections, optionally coupled to magnetic means - provided that this temporary structure is apt to keep the blades L and the interposed lengths of spacing yarn F adjacent and mutually tightened during the reed assembly process and the final locking step thereof. It must therefore be understood that anyone of such temporary locking structures of this type, regardless of its nature and configuration, is included within the protection scope of the present invention.

[0029] A preferred embodiment of the method for manufacturing loom reeds according to the invention is schematically shown in Figures 3 to 5. In this embodiment, the temporary support structure comprises five parallel rods 2, alternately arranged along the height of reed 1 being formed, on one side and on the opposite side thereof, and preferably at the same reciprocal distance.

[0030] Figure 3 shows schematically, in a front view and in an enlarged scale for a better understanding, a portion of a weaving loom reed being formed, in which blades L, separated by empty gaps S - each intended for the passage of one or more warp yarns - whose width is determined, according to the invention, by the insertion of a length of spacing yarn F (not shown in Fig. 3 for clarity). As already mentioned, rods 2 are positioned alternately on one side and on the other side of blades L, respectively, as can be seen more clearly in Fig. 4, which shows a side view of the reed being formed.

[0031] The Applicant has in fact supposed that the blade residual stresses frequently arising in the reeds of the prior art, be essentially due to a not perfectly balanced compression action that the spacing yarn coils can apply on the individual blades, in the area in which said coils cross over the blades, and therefore that, by completely eliminating this cross over area - thanks to the fact that the spacing yarn is used in the form of different and mutually independent lengths - it would be possible to root out the problem related to blade residual stresses and, at the same time, lay the basis for an improved reed assembly method that would achieve all the desired objects.

[0032] Thus operating, the spacing yarn F forms in fact a plurality of "mutual spacing" points of the blades F1, F2, F3, F4, F5, and F6 where the branches of spacing yarn F in a wavy configuration pass from one side of blades L to the other, offering a stable and scattered support, particularly effective in assuring a perfect blade parallelism even when operating with blade having an extremely reduced thickness.

[0033] Three different embodiments are currently provided, according to the present invention, to industrially apply this innovatory method for manufacturing a reed that provides for the use of a spacing yarn F formed in individual lengths having a wavy conformation, as described above, which are laid on the lateral side and between each blade.

A) In a first embodiment, a rectilinear length of spacing yarn F is inserted as such between rods 2, at a sufficient distance from the last inserted blade, after having caused the rods 2 to be elastically bent in opposite directions , and then inserting the length of spacing yarn F into a sort of "shed" P so formed between the same rods, said shed P being consistent with a desired final pattern of the mutual position between the length of yarn F and the rods 2.
To achieve this result, rods 2 are bent in the directions schematically indicated with arrows in Figs. 5B and 5C, so that, in the proximity of the insertion zone of the length of spacing yarn F:

- rods 2 that (in the drawing) are positioned above blades L are bent downwards, and
- rods 2 that (in the drawing) are positioned under blades L are bent upwards.

Bending of rods 2 can indifferently take place at an intermediate point of said rods, as illustrated in Fig. 5B, or at their end, as illustrated in Fig. 5C. Deformation at an intermediate point is more suitable for very flexible rods, while deformation at the end is more suitable for more rigid rods. In any case, bending should occur to such an extent as to form a shed P of sufficient width for the insertion of spacing yarn F.
Once the length of spacing yarn has been completely inserted into the shed P formed between rods 2, these are returned in their unbent condition, thus immediately causing a wavy configuration deformation of the length of yarn F. Said yarn F is then pushed and tightened by an abutting member (known per se and therefore not illustrated), against the last inserted blade.
In an alternative embodiment, it is possible to constantly keep rods 2 in a bent position, for example, preferably at the end of said rods as illustrated in Fig. 5C, and use an abutting member consisting of a plurality of fingers running in the gaps between rods 2. In this case, the length of yarn F inserted in shed P is progressively deformed in a wavy configuration by the contrast reaction applied thereon by rods 2, as they resume their regular unbent position, approaching the last inserted blade, on which the length of spacing yarn F is finally laid. A new blade L is then inserted, which is pressed and tightened against the previous blade, the length of yarn F remaining then interposed between said blades and interlaced with rods 2.
B) In a second embodiment, rectilinear lengths of spacing yarn F are deformed to take a wavy configuration that respects the geometric layout of rods 2. In this embodiment, rods 2 are all arranged on the

same side of the reed, and precisely on the side facing upwards during the assembly step in which the reed is arranged in a horizontal plane, while the necessary support for blades L is provided by lateral supports on which the blade ends rest. The already shaped length of spacing yarn F is then placed directly on rods 2, in proximity of the blade insertion position, pushing it, with the abutting member, against the last inserted blade. A new blade is then inserted in a manner identical to that described for the previous embodiment A.

The wavy configuration of the lengths of spacing yarn F may be such that said yarn is caused to project with his angular portions also from the lower side of the reed or not. In the first case, once the blade arrangement has been completed, rods are also inserted on the lower side of the reed, where they initially were not provided, by sliding them inside said angular portions of the spacing yarn F projecting from the blades. In the second case, since the lengths of spacing yarn do not project from the lower edge of the blades, these can be moved with a tray, preferably a magnetic tray, upon which they rest with their lower edge.

C) In a third embodiment, the lengths of spacing yarn F are instead already prefabricated in the number and in the wavy conformation required for the assembly of a given reed and are inserted as a stock cartridge upon rods 2, at the end opposite to the one where blade insertion begins. When manufacturing the reed, each single yarn length is then simply withdrawn from the stock cartridge and slid along rods 2, from the initial position where the stock cartridge of preformed lengths of yarn F is arranged up to the blade insertion position, obviously alternating after each length of yarn the insertion of a blade according to the method described above.

[0034] In embodiments B and C of the manufacturing method of the invention, the initial deformation of the lengths of spacing yarn F is preferably achieved by means of a bending apparatus for yarn F placed in proximity of rods 2 and comprising movable fingers which can be mutually inserted between fixed abutments and a feeding reel for spacing yarn F. A movable gripper grips the free end of the yarn and brings it into the working area of the movable fingers. The movable fingers advance in succession, in a direction perpendicular to spacing yarn F, each inserting between two adjacent fixed abutments, so as to progressively deform the yarn F with a series of loops, withdrawing the additional required yarn F from the feeding reel. Once the desired wavy configuration of the spacing yarn F has been completed, a fixed gripper grips the yarn in proximity of the feeding reel and a cutting device pull apart yarn F from the reel, thus creating the desired length of spacing yarn in a wavy configuration, which can thus be inserted on rods 2.

[0035] It is clear from the foregoing that the number n of movable fingers is equal to the number n of desired loops to be formed on spacing yarn F, while the number of fixed abutments is equal to n + 1, considering however that one or both fixed end abutments may be replaced, in their function, by said mobile and fixed gripper. The movable fingers may operate either by thrust or by traction, preferably by means of a particular conformation of the tip or by means of a gripping member transversely protruding from said tip and suitable for hooking spacing yarn F. Particular preferred conformations of the bending of each loop may be obtained simply by modifying the shape of the movable fingers, of their gripping members, or of the fixed abutments.

[0036] The final result of the operations described in the aforesaid embodiments A, B, and C of the method for manufacturing a reed of the invention, is therefore the formation of a length of spacing yarn F having a desired wavy conformation comprising a plurality of loops, suitable to be coupled to the rods 2 arranged either on one side only of the reed being formed, or in an alternating and offset position on both sides of the reed being formed. Therefore, once spacing yarn F has assumed this wavy conformation, in whatever position it was thus formed, it is slid along rods 2 to the necessary extent - through an abutting member, known per se - until it comes into contact with the blade L last inserted on the reed being formed.

[0037] As already mentioned, it must be further specified that each length of spacing yarn F thus shaped is intended to be simply laid on the side surface of a blade L, upon which it is then tightened when the next blade is inserted. During this same tightening step, or even at the end of the blade insertion step, it may optionally be envisaged, when rods 2 are in an alternating arrangement on the two sides of the reed, to apply a moderate pulling force on the two ends of spacing yarns F, by means of a dual gripper traction device, in order to bring said spacing yarn F in close contact with rods 2 and then to bend the two ends of said yarn around external rods 2 to the desired extent. At these external rods 2, in fact, it is convenient for spacing yarn F to be bent, in relation to the longitudinal direction of blades L, at an angle at least equal to that formed by the same yarn on the internal rods 2 to create also external passage points F1 and F6 on blade L. However, to avoid any interference with the end zone of blades L intended to be impregnated in the crosspieces T, as well as to cause a better grip of spacing yarn F on rods 2, this angle may be higher, e.g., up to 90°.

[0038] Thanks to this arrangement, which comprises several rods 2 arranged alternately, on one side and on the other side of blades L, respectively, and lengths of spacing yarn F in a wavy configuration between said rods 2, the blades L are held in the correct position, as a result of the pressure exerted on their edges by rods 2, just as well as with the rods with opposed shaped bar pairs of the prior art.

[0039] As it is readily evident from all of the foregoing, the main advantages achieved by the method for manufacturing a reed according to the invention are:

- the presence of several contact points between spacing yarn F and blade L; this prevents blades L from bending, particularly those blades having a very low thickness, thus maintaining the passage gap for the warp yarn at a perfectly constant width, both between adjacent blades and along the height of the reed;
- the lack of continuity of spacing yarn F, i.e., the fact that spacing yarn F is fed in lengths and simply laid on the lateral surface of blade L without having to provide areas in which the yarn must cross over the back of the blade. This assure a complete absence of those blade stresses which, in the reed assembly method according to the prior art, could be produced during the winding of the retaining yarn on two rods;
- greater speed in the process of inserting the spacing yarns F, since the formation of coils is not required and, moreover, in embodiments A and B of the manufacturing method, the step of preparing a length of spacing yarn F may be carried out in at least partial overlap with a blade insertion step or, in embodiment C, such step is already carried out during prefabrication, while during the process it is only necessary to slide into position the lengths of the already preformed spacing yarn F.

[0040] After alternately packing the blades and the lengths of spacing yarn, for the length required by the expected size of the reed, one proceeds with the usual process of permanently fixing blades L by impregnating their opposite ends with resin, according to the prior art. This operation makes it possible to form a lower and an upper seam, which assure a stable and lasting retention of the blades forming the reed dents and the maintenance over time of an accurate spacing between them as determined during the reed manufacturing step.

[0041] According to a further feature of the invention, once the resin has hardened it is then necessary to eliminate both rods 2 and the spacing yarns F interposed between one blade and the other, since these components no longer perform neither a retaining nor a spacing function, both of which are now assured by said resin seams. To facilitate the disassembly operation of rods 2, a longitudinal cut of spacing yarns F may be made at the back of one or more of said rods. It is also preferable to arrange the outermost rods 2 in a slightly more internal position than the usual position of the rods of the prior art, so as to prevent such rods and the spacing yarns F resting thereon from being affected by resin impregnation in the U-section and to allow for easy removal thereof.

[0042] In the foregoing, we have always spoken about rectangular L blades for ease of representation; however, an identical method of reed formation may also be used for air loom blades, which, as is known, have their side surface bounded, on one side, by a straight edge, and on the other, by a shaped edge in order to allow for the formation of a channel for weft pneumatic transport.

[0043] It is understood, however, that the invention should not be construed as limited to the particular arrangements illustrated above, which only make up some exemplary embodiments thereof, and that several variants are possible, all within the skill of a person ordinarily skilled in the art, without thereby departing from the protection scope of the invention itself, which is only defined by the following claims.

Claims

1. Method for manufacturing a reed for weaving looms, of the type comprising:

a. a first step wherein individual blades (L) intended to form the reed dents are assembled in succession, side by side, parallel to a predefined lying plane and equally spaced apart, in a temporary support structure consisting of longitudinal rods (2), while interposing gauged spacing yarns (F) between each adjacent pair of blades (L); and

b. a second step wherein the free ends of the blade assembly assembled in said temporary support structure are inserted and locked in support crosspieces (T);

characterized in that said spacing yarns (F) interposed between each pair of said adjacent blades (L) comprise at least one length of spacing yarn (F), arranged against the lateral surface of said blades (L) and having a wavy configuration in a plane parallel to said lying plane.

2. Method for manufacturing a reed as in claim 1, wherein said wavy configuration of said length of spacing yarn (F) comprises the sinusoidal, zig-zag, fret shape, or any other, even irregular, shape allowing the length of spacing yarn (F) to cross each blade several times, in different positions of the blade.

3. Method for manufacturing a reed as in claim 2, wherein said temporary support structure used in said first assembling step of the blades (L) comprises at least three longitudinal rods (2).

4. Method for manufacturing a reed as in claim 3, wherein said temporary support structure comprises at least five longitudinal rods (2).

5. Method for manufacturing a reed as in claim 3 or 4, wherein said longitudinal rods (2) are equally spaced apart along the reed height.

6. Method for manufacturing a reed as in any one of claims 1 to 5, wherein said lengths of spacing yarn

(F) are inserted in a rectilinear configuration between the rods (2), spaced apart from the last inserted blade (L) and after having caused the rods (2) to elastically bend in opposite directions to form a "shed" P between said rods (2) consistent with a desired final pattern of the mutual position between the lengths of yarn (F) and the rods (2).

7. Method for manufacturing a reed as in claim 6, wherein after the insertion of said lengths of spacing yarn (F) between the rods (2), said rods (2) are brought back into their unbent condition, so deforming said lengths of spacing yarn (F) in said wavy configuration, and then said lengths of spacing yarns (F) are caused to slide between the rods (2), through an abutting member, up to the blade (L) insertion position.

8. Method for manufacturing a reed as in claim 6, wherein after the insertion of said lengths of spacing yarn (F) between the rods (2), said lengths of yarn (F) are caused to slide between the rods (2), through an abutting member which operates in the gaps between said rods (2), up to the blade (L) insertion position, said lengths of spacing yarn (F) being progressively deformed in a wavy configuration by the contrast reaction applied on the same by the rods (2).

9. Method for manufacturing a reed as in any one of claims 1 to 5, wherein said lengths of spacing yarn (F) are previously deformed according to said wavy configuration in a bending apparatus of the spacing yarn (F) comprising movable fingers which can be mutually inserted between fixed abutments, a feeding reel of the spacing yarn (F), a movable gripper for inserting a length of spacing yarn (F) between said movable fingers and said fixed abutments, a fixed gripper for stopping in position the spacing yarn (F) coming out of said feeding reel and a cutting device of the spacing yarn (F) arranged in proximity of said fixed gripper.

10. Method for manufacturing a reed as in any one of claims 1 to 5, wherein said lengths of spacing yarn (F) are prefabricated in a spare cartridge comprising said lengths of spacing yarn (F) in the number and in the wavy configuration necessary for the assembly of the entire reed, said spare cartridge being positioned at the free ends of the rods (2).

11. Method for manufacturing a reed as in claim 10, wherein said lengths of spacing yarn (F) are taken out in succession from said spare cartridge and caused to slide along the rods (2) up to the blade (L) insertion position of, arranging the spacing yarns (F) between said blades (L).

12. Method for manufacturing a reed as in any one of claims 1 to 11, wherein said length of spacing yarn (F) is caused to rest on the entire height of the lateral surface of each blade (L).

13. Method for manufacturing a reed as in any one of claims 1 to 11, wherein said length of spacing yarn (F) is caused to rest on a respective blade (L) so that the loops formed by the wavy configuration thereof project at least from one side of the lateral surface of said blade (L), resting on respective rods (2), while crossing the lateral surface of the blade in multiple positions.

14. Method for manufacturing a reed as in any one of the preceding claims, wherein at the end of said step b), said rods (2) and said lengths of spacing yarn (F) are removed from the reed.

15. Reed for weaving looms, of the type comprising a plurality of blades (L) forming the reed dents, arranged side by side, mutually parallel and equally spaced apart, **characterized in that** the free ends of said blades (L), inserted and locked in support crosspieces (T), are devoid of other supporting structures and of spacing yarns (F) arranged between said blades (L).

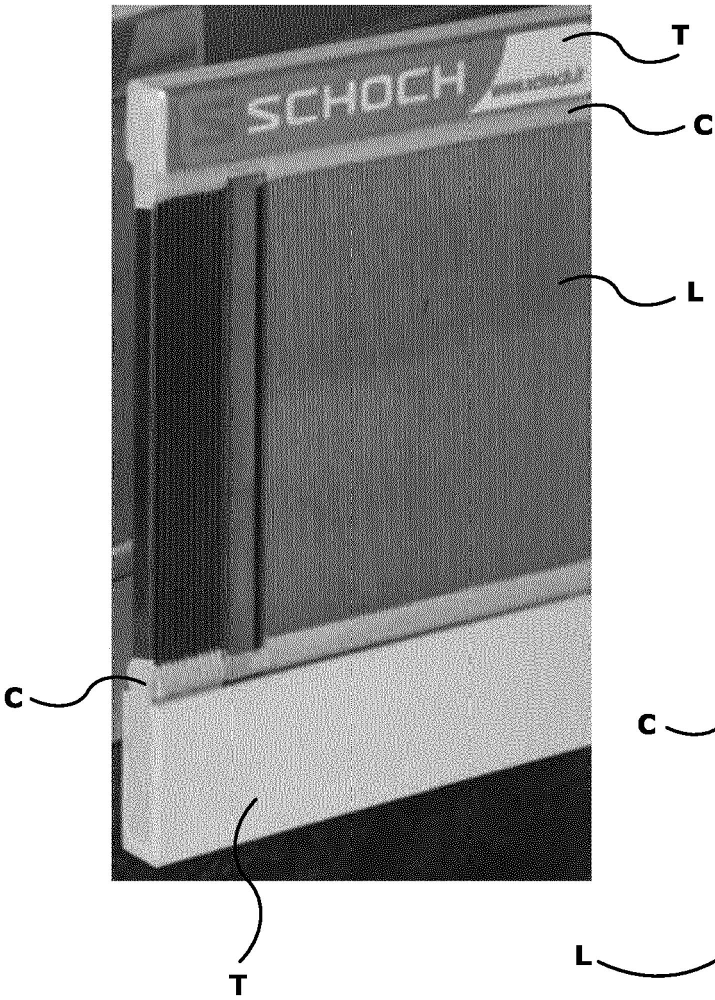

FIG. 1

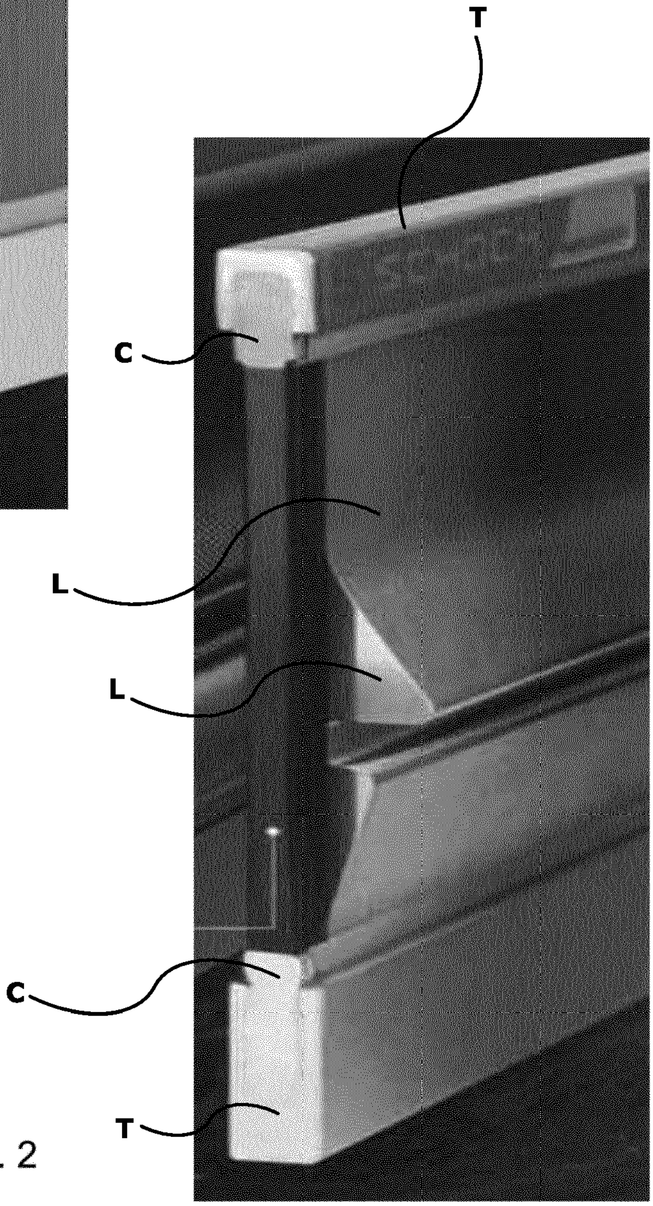

FIG. 2

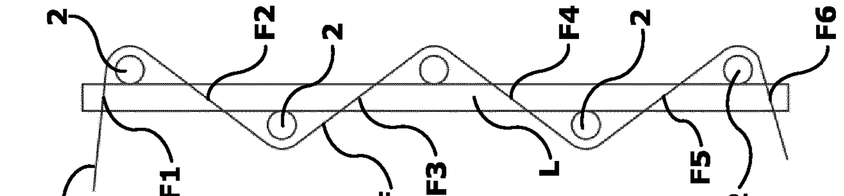

FIG. 4

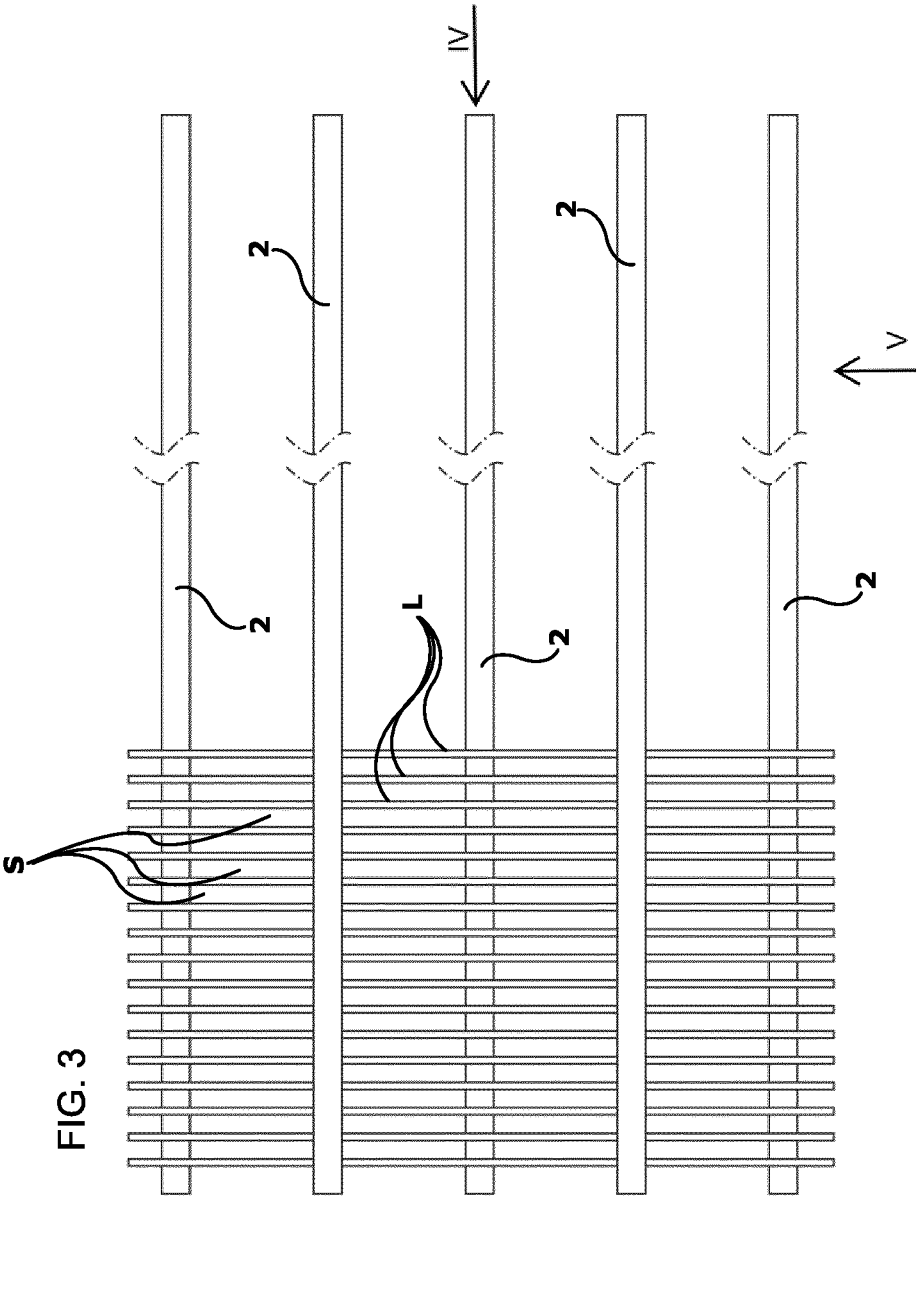

FIG. 3

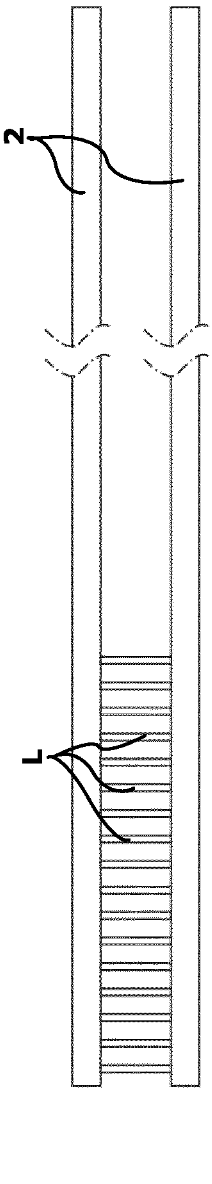

FIG. 5A

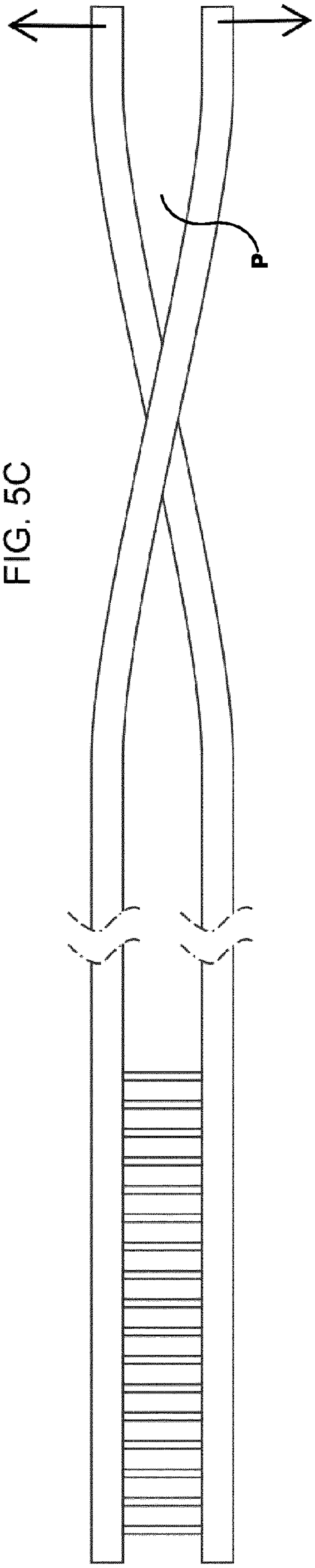

FIG. 5C

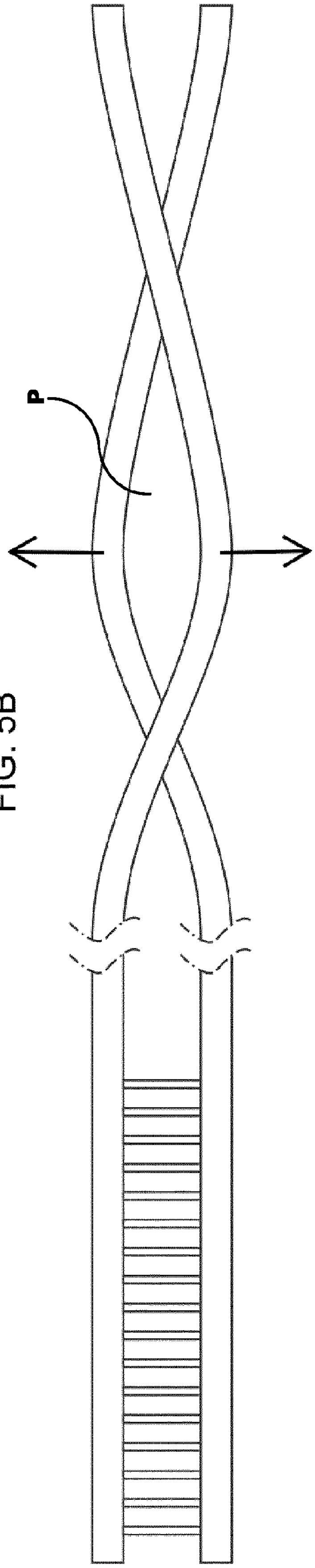

FIG. 5B

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EUROPEAN SEARCH REPORT

Application Number
EP 18 17 7261

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			D03D D03J

The present search report has been drawn up for all claims

1

Place of search	Date of completion of the search	Examiner
Munich	13 September 2018	Iamandi, Daniela

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