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(54) False selvedge forming device for textile looms

(57) A false selvedge forming device in looms is described, of the type comprising a drive shaft performing an alternating rotational movement and a pair of arrays of heddles, for moving warp yarns, connected by means of respective transmission means to said rive shaft for an opposing alternating movement, said transmission means being in the form of a pair of bundles of cords, on the one hand connected to the upper ends of said heddles and on the other hand converging towards two opposite points of a rotating member integral with said actuating shaft, the bottom ends of the heddles being retained by tensioning means.

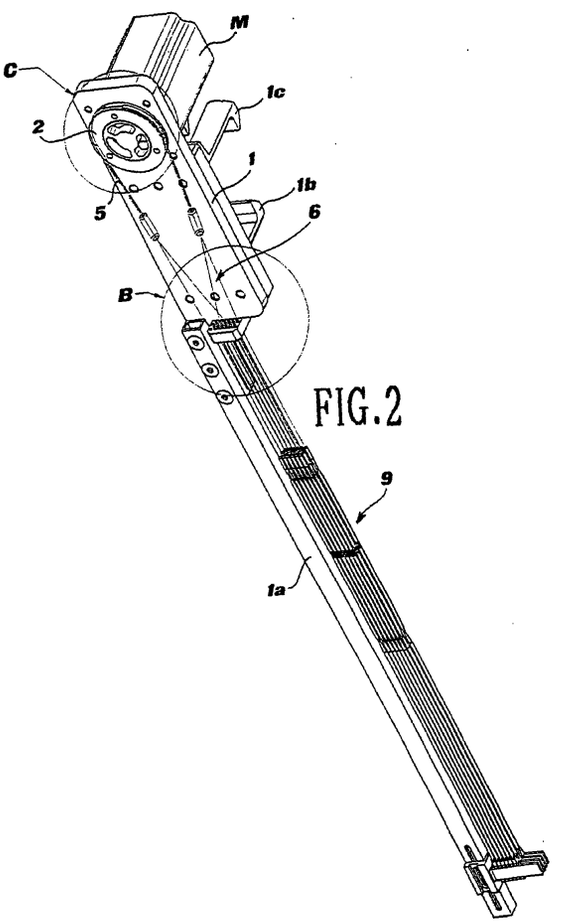

FIG.2

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Description

[0001] The present invention relates to a false selvedge forming device in gripper or air textile looms.

[0002] As known, during the weaving process, in modern looms it is envisaged forming a so-called "false selvedge" on both sides of the fabric. The false selvedge is a short lateral section of the fabric where the warp and weft yarns are suitably interlaced so as to tie and keep taut the free ends of the weft yarns, during and immediately following their insertion, so that it is then possible to perform correct cutting and therefore provide the fabric with an optimum finish along the sides.

[0003] In fact, once the false selvedge has been formed, by applying to it tensioning devices such as templates, it is possible to perform cutting of the weft yarns - in the zone where warp yarns are not present, between the fabric and the false selvedge - at the desired distance from the edge of the fabric, while the weft yarns are perfectly taut, so as to obtain a lateral fringe of weft ends having a perfectly uniform height.

[0004] During tying of the false selvedge, the weft yarn is inserted between two series of warp yarns (up to about twenty for each side of the fabric) which open alternately with a uniform lateral warp shed and with a specific weave (for example one-one or two-two), independent of that of the main fabric.

[0005] In the false selvedge forming devices the warp yarns are controlled by yarn-guide elements (heddles) in turn normally operated by sliders moved by means of suitable drive mechanisms.

[0006] In order to be able to provide an increasingly greater degree of operational flexibility compared to entirely mechanical devices (where the yarn-guiding elements were connected by means of rigid kinematic chains to the main shaft of the loom), some devices independently controlled by an electric motor electrically connected to the main motor of the loom have now been introduced onto the market.

[0007] This type of selvedge forming device has proved to be more versatile and preferable, among other things because, being free from any mechanical connection to the main movement system of the loom, it may be easily adjusted and applied to or removed from the loom in a very simple manner.

[0008] Examples of these devices of the prior art are illustrated, for example, in WO 96/38608, EP 893,522 and EP 1,079,009.

[0009] All these mechanisms, however, make use of complicated systems of connecting rods or cranks or other rotary mechanisms in order to convert the rotary movement of the motor into a reciprocating rectilinear movement of the sliders for displacing the yarn-guide heddles. As can be understood, these movement members introduce undesirable friction and inertia into the system.

[0010] Moreover, the slider for moving the heddles is typically operated by means of a substantially rigid transmission system acting on only one end, namely operating alternately with a pulling and pushing force. If the sliders and the heddles are not perfectly guided, operational malfunctions may occur, such as seizing, which could also produce deformations or in any case irregularities in the weave.

[0011] It is an object of the present invention provide a novel control system for forming the false selvedge, which is compact and low-cost, which envisages a minimum number of mechanical transmission members and which allows the heddles to be operated at both ends.

[0012] A further object of the invention is to provide a system which still preserve some degrees of elasticity able to take up any malfunctions.

[0013] These objects are achieved with the system which is substantially described in the accompanying main claims.

[0014] Other inventive features of the invention are described in the dependent claims.

[0015] Further characteristic features and advantages of the device according to the invention will emerge, however, more clearly form the detailed description which follows of a preferred embodiment thereof, provided by way of example and illustrated in the accompanying drawings, in which:

[0016] Fig. 1 is a front elevation view of a device according to the invention;

[0017] Fig. 1A is an enlarged view of the detail indicated by "A" in Fig. 1;

[0018] Fig. 2 is a perspective view of the device according to Fig. 1;

[0019] Figs. 2A and 2B are enlarged views of the details indicated respectively by "B" and "C" in Fig. 2;

[0020] Fig. 3 is a schematic, partially interrupted, elevation view which illustrates the position of the device according to the invention on a loom;

[0021] Fig. 4 is a perspective view of a second embodiment according to the invention; amd

[0022] Figs. 4A and 4B are enlarged views of the details indicated by "D" and "E" in Fig. 4.

[0023] Figs. 1 and 2 show a first device to form the false selvedge according to the invention. An electric motor M is mounted on a base-piece or base plate 1 and has, fixed to its rotational spindle, a pulley 2 provided with a tighteable groove 3. For example the groove is formed between two plates 2a and 2b which may be tightened together by means of Allen screws 4 (Fig. 2B).

[0024] The motor M is rotationally controlled in an alternating manner, with rotational amplitudes depending on the desired degree of displacement in the movement, in accordance with methods which are well-known in the sector.

[0025] A connecting cable 5, for example of the unextendable type, used also in the harnesses of Jacquard machines, is fixed inside the groove 3 and its ends are joined together, preferably in a symmetrical manner, to two respective bundles of cords 6.

[0026] The individual cords 6i are grouped together in converging bundles and then joined to the ends of the cable 5 using a known technique, for example by means of a clamp 7. It will be noted that, for reasons of clarity, in Figs. 1-3 the cords 6 are shown very schematically, but a person skilled in the art will be able to understand fully the actual arrangement.

[0027] The bottom end of the base-piece 1 (with reference to the working position of the device) is provided with a yarn-guide plate 8 having an ordered plurality of holes equal in number to the number of cords 6i: the latter are thus inserted into these holes and then fixed to the ends of eyed heddles 9, of the known type, each of which is able to operate a warp yarn of the false selvedge. Depending on how the connections are made, a double array of heddles is thus obtained, a first series belonging to the first bundles of cords and a second series belonging to the second bundle of cords.

[0028] An extension arm 1a is also fixed onto the base-piece 1, said arm extending parallel to the cords and to the heddles and having, at its distal end, a fixing clamp 10.

[0029] According to a first embodiment of the invention, a plurality of resilient elements 11 (one per heddle) is arranged between the fixing clamp 10 and the bottom end of the heddles 9, said elements being able to impart a resilient recall tension to the heddles 9.

[0030] The resilient elements 11 are, for example, in the form of torsional springs.

[0031] The fixing clamp 10 is preferably mounted in an axially adjustable manner along the arm 1a.

[0032] As can be understood, the resilient elements 11 not only keep the heddles 9 tensioned such that they remain aligned with each other in the correct position, but also produce the necessary recall force for the downward return movement of the said heddles, since the cords 6 are only able to transmit a tension force directed upwards.

[0033] The elastic characteristics of the elements 11 are suitably chosen so as to have a sufficient downward recall force and at the same time prevent the own frequencies of the system assuming values dangerously close to the operating frequencies of the device.

[0034] The mode of operation of the system is thus evident. The motor M is controlled, for example by means of an electric axis with the main motor of the loom, so as to perform alternating rotations in both directions, said rotations - by means of the pulley 2 and the cable 5 - being converted into an alternating raising action of the two bundles of cords 6. Correspondingly, the two arrays of heddles 9 are alternately raised, by means of the raising action illustrated above, and lowered, as a result of the recall effect of the resilient elements 11.

[0035] Fig. 3 shows the position assumed by the device according to the invention on the loom.

[0036] By means of engaging means 1b and 1c the base-piece 1 is supported and rigidly fixed to a cross-member T of the loom. Due to the compactness of the device, the bundles of cords and the extension arm 1a are easily accommodated in the restricted space between the reed P and the heddle frame group Q, at a height such that the heddles 9 are able to operate correctly in the region of the warp shed Bo.

[0037] As can be seen, the device described does not have complex mechanical transmission members interacting with each other, most of the movement being ensured by slender cords and resilient elements. This results in low inertia and minimum friction, thereby fully complying with some of the objects mentioned in the introduction. Moreover, the weaving members, i.e. the heddles 9, are subject only to tractional forces in the two directions, which helps reduce the likelyhead of malfunctions.

[0038] The presence of the springs 11 also introduces into the system a certain degree of elasticity which is able to absorb, without excessive stresses, any seizing or malfunctions, thereby also achieving another desired object.

[0039] According to an alternative embodiment of the invention (Fig. 4), the two arrays of heddles 9 are fixed at the bottom, to bottom cords 12 instead of to resilient elements. The bottom cords 12 pass through a second holed yarn-guide plate 13 (Fig. 4A) , which keeps them correctly spaced and guided, and then converge into two bottom bundles 12a and 12b tied in a similar manner to that described for the upper cords 6. The ends of the two bottom bundles 12a and 12b are joined to the two ends of a transmission cable 14 passing around a transmission pulley 15 - and preferably "clamped" there as in the case of the cable 5 and the upper pulley 2 - said pulley 15 being installed rotatably on a bottom base-piece 16 fixed to the arm 1a.

[0040] In this way, the upward pulling action, exerted by the motor on one of the two bundles 6a or 6b and therefore on the respective heddle array, is converted by means of the cable 14 and the pulley 15 into a downward pulling movement of the other heddle array thus moved in an alternating manner without the application of pushing forces.

[0041] According to a preferred embodiment of this variant, the bottom base-piece 16 is mounted on the arm 1a by means of resilient means which pull it downwards, so as to keep the bottom bundles 12a and 12b always properly tensioned with the associated heddles and upper cords.

[0042] It is understood, however, that the invention is not limited to the particular configurations illustrated above, which constitute only non-limiting examples of the scope of the invention, but that numerous variants are possible, all within the reach of a person skilled in the art, without thereby departing from the scope of the said invention.

[0043] For example, the number of heddles and cords which make up the pair of arrays illustrated in the figures is not to be regarded as limiting, it also being possible

to reduce to a single unit.

Claims

1. False selvedge forming device in textile looms of the type comprising a drive shaft apt to perform an alternating rotational movement and a pair of arrays of heddles, for moving warp yarns, connected by means of respective transmission means to said drive shaft for a reciprocating movement, **characterized in that** said transmission means are in the form of a pair of bundles of cords (6), on the one hand connected to the upper ends of said heddles (9) and on the other hand converging towards two opposite points of a rotating member (2) fixed to said drive shaft, the bottom ends of the heddles being retained by tensioning means (11) .

2. Device according to Claim 1, wherein said cords (6) pass through holes of a yarn-guide plate (8) arranged between the ends of the heddles (9) and said rotating member (2).

3. Device according to Claim 1 or 2, wherein said tensioning means (11) comprise resilient means fixed to a clamp (10) arranged fixed beyond the heddles, on the opposite side to the cords.

4. Device according to Claim 3, wherein said clamp (10) is fixed to a distal end of an extension arm (1a) integral with a base plate (1) on which said rotating member (2) is rotatably mounted.

5. Device according to Claim 4, wherein said clamp (10) is adjustable positionwise on said arm (1a).

6. Device according to any one of Claims 3 to 5, wherein said resilient means are torsional springs.

7. Device according to Claim 1 or 2, wherein said tensioning means are reversing means (14, 15) which connect the bottom ends of the two arrays of heddles (2) so as to reverse the direction of transmission of a force.

8. Device according to Claim 7, wherein said reversing means are in the form of a cable (14) which is arranged around a pulley (15) and the ends of which are connected to said two arrays of heddles (9).

9. Device according to Claim 8, wherein said pulley (15) is mounted on a supporting element (16) constrained by resilient means which oppose the tension imparted to the heddles by said rotating member.

10. Device according to any one of the preceding claims, wherein said rotating member (2) is essentially in the form of a wheel composed of two portions (2a, 2b), one of which can be joined to the other one with force so as to grip in between means for connection (5) to said ends of the converging bundles (6).

11. Device according to Claim 10, wherein said connecting means are in the form of a cable (5) which is fixed on said wheel (2) and the ends of which are joined to the two converging bundles of cords.

12. False selvedge forming device for textile looms, of the type in which a first array of heddles is moved with a reciprocating movement relative to a second array of heddles by means of motor means acting on the same proximal end of said heddles, **characterized in that**, at the opposite distal ends, said first array of heddles is connected to the second array of heddles by reversing means able to reverse the direction of transmission of a force.

13. Device according to Claim 12, wherein said reversing means are in the form of a cable (14) which is arranged around a pulley (15) and the ends of which are connected to said two arrays of heddles (9).

14. Device according to Claim 12 or 13, wherein said reversing means are constrained by resilient means on a base element (1, 1a) so as to oppose the tension imparted to the heddles by said motor means.

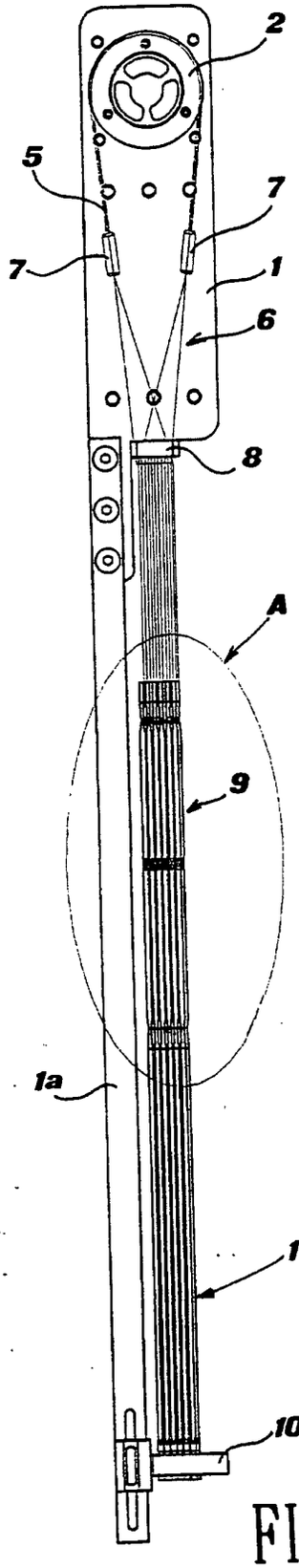

FIG.1

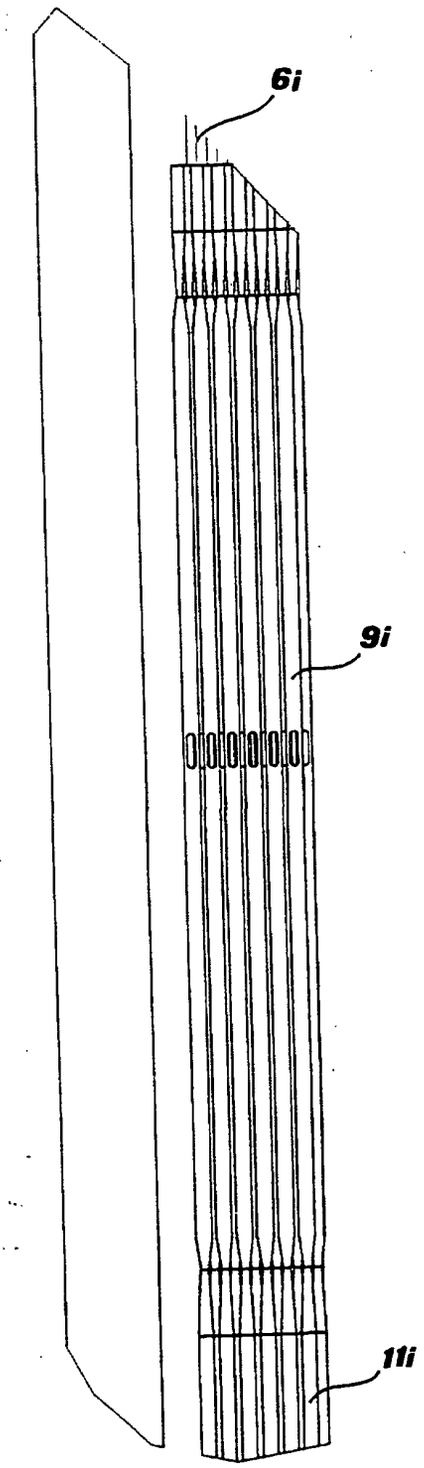

FIG.1A

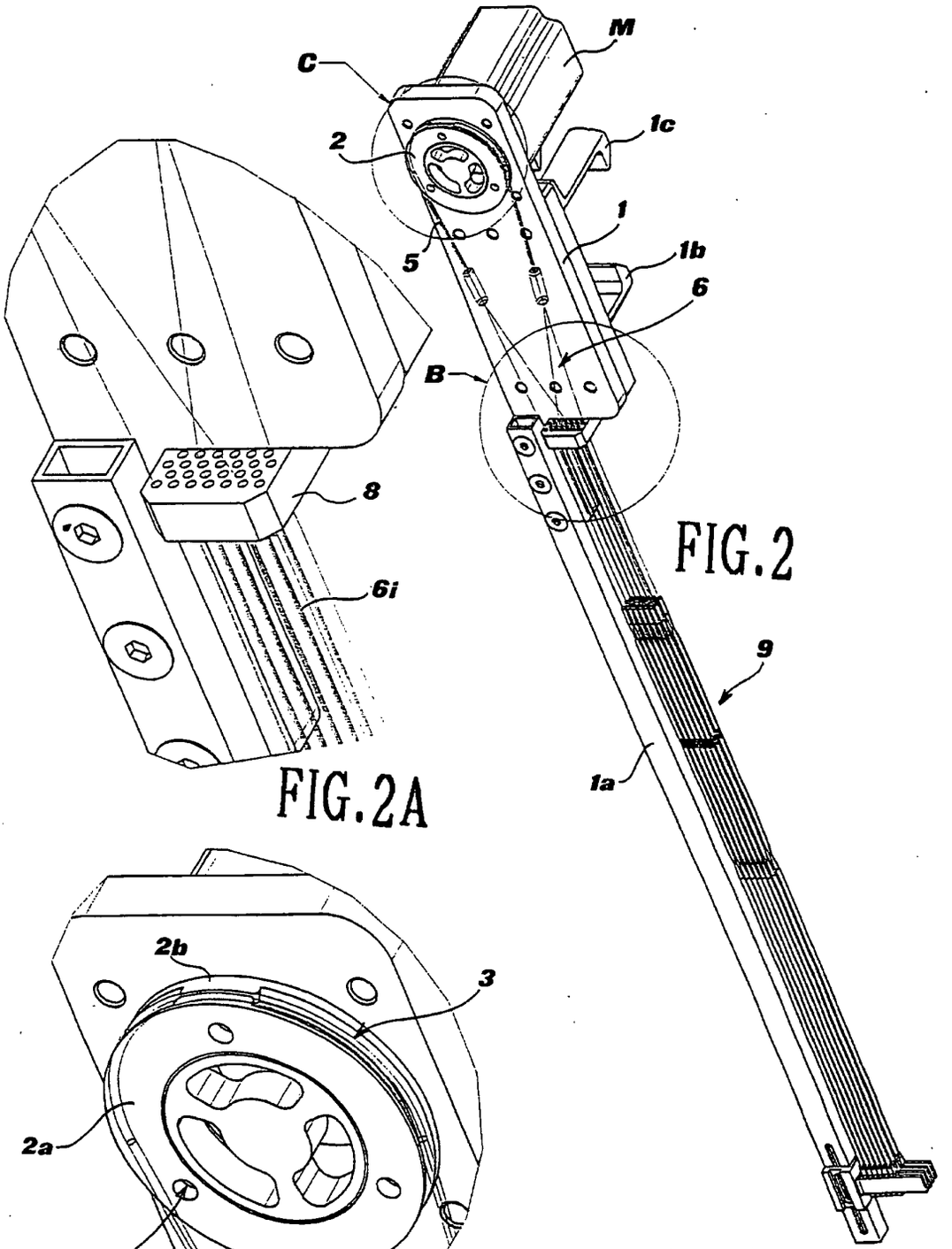

FIG.2

FIG.2A

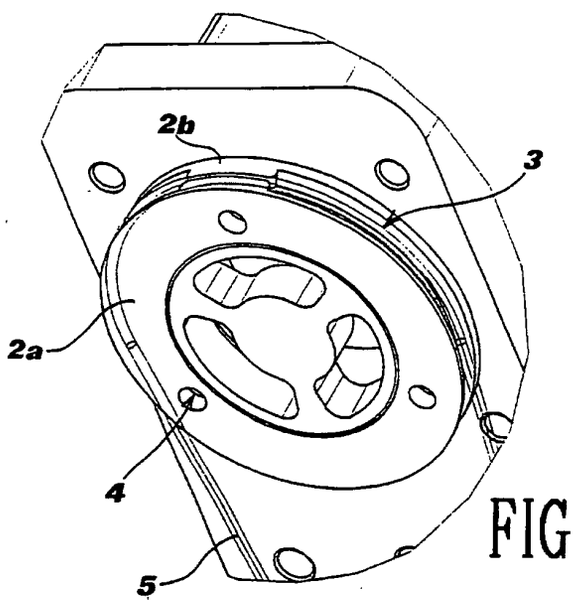

FIG.2B

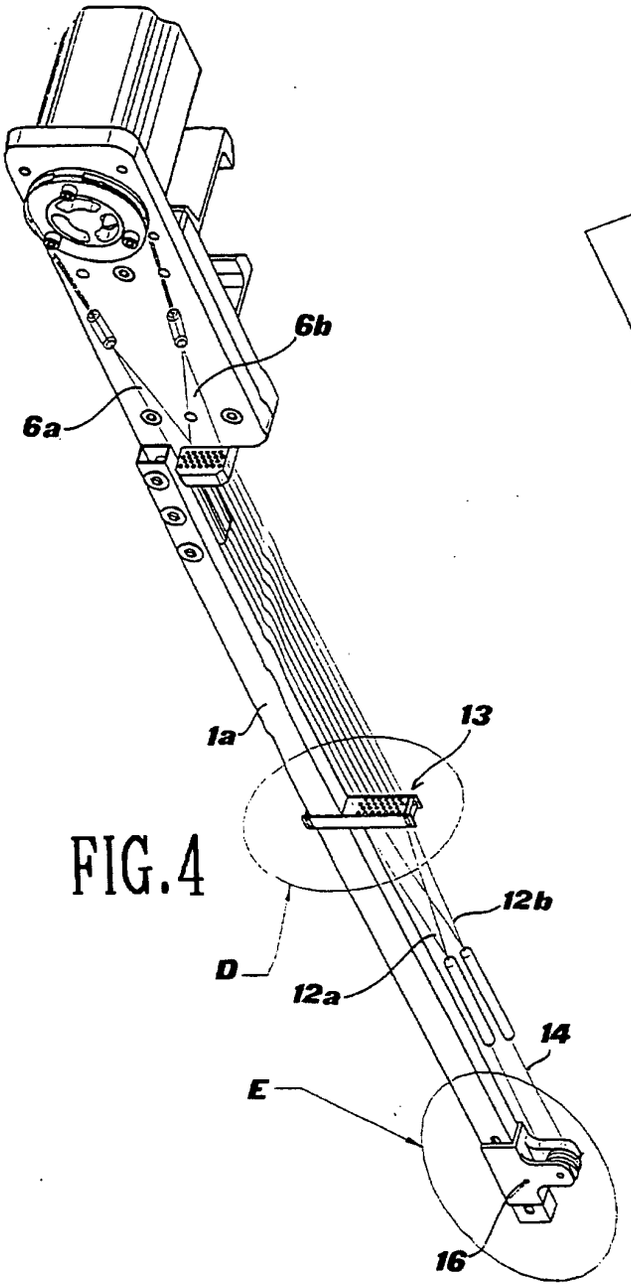

FIG.4

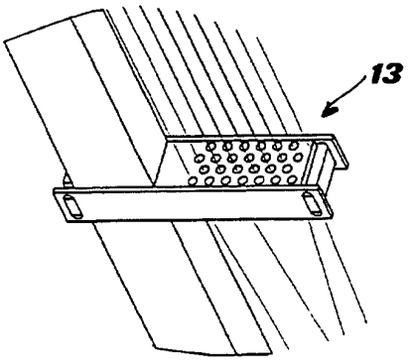

FIG.4A

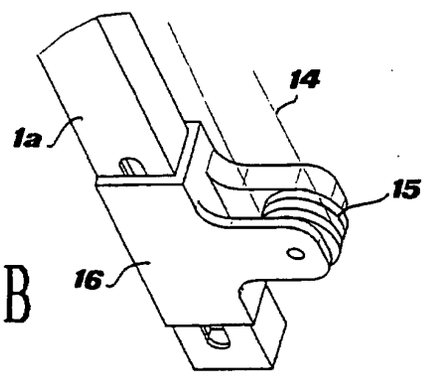

FIG.4B

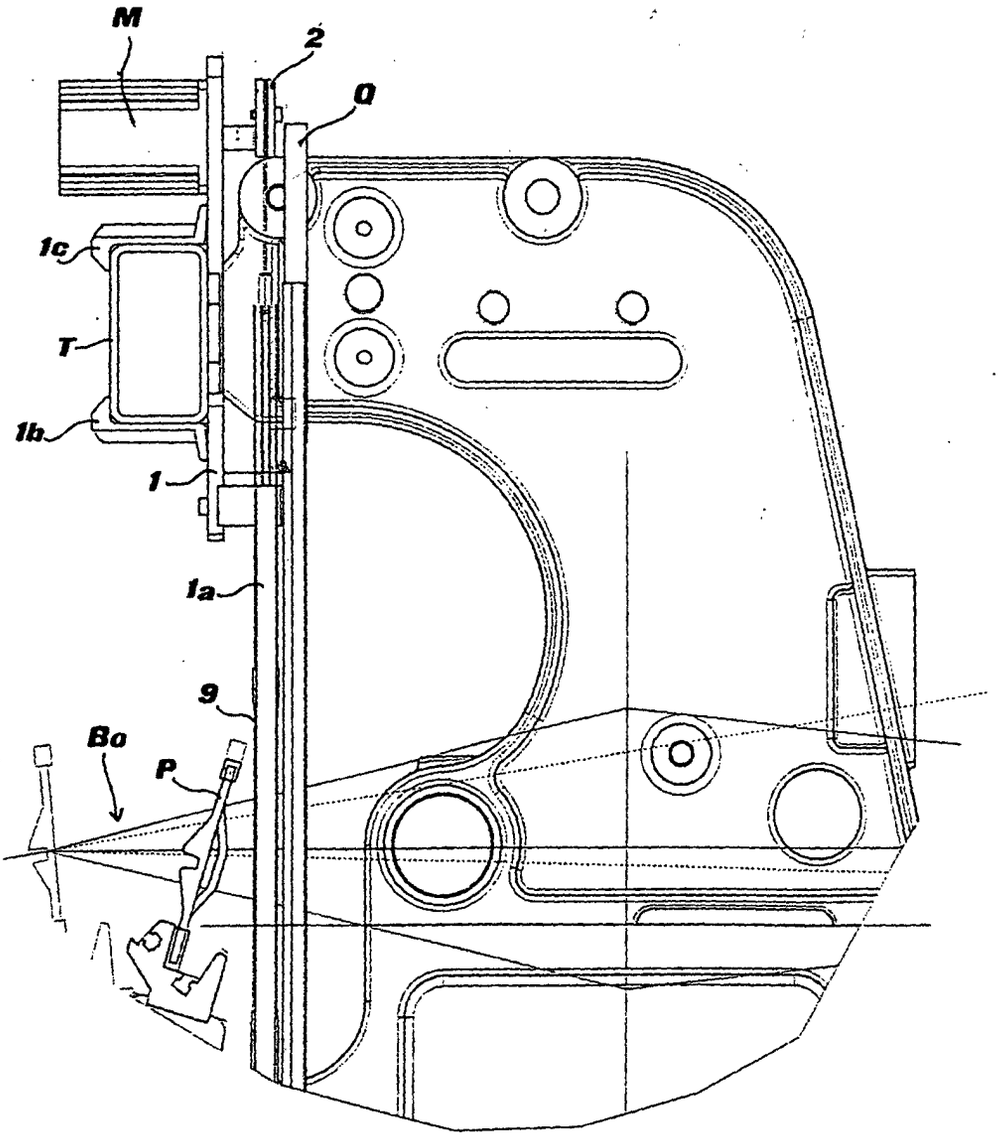

FIG.3

European Patent Office

EUROPEAN SEARCH REPORT

Application Number
EP 03 10 3517

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.7)
A	US 6 189 576 B1 (MARKWARD DIETMAR) 20 February 2001 (2001-02-20) * the whole document *	1-11	D03C11/00 D03D47/40
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A	* the whole document *	13,14	
A	EP 0 750 061 A (ICBT DIEDERICHS SA) 27 December 1996 (1996-12-27) * column 4, line 14 - line 23; figure 2 *	12-14	

TECHNICAL FIELDS SEARCHED (Int.Cl.7)
D03C D03D

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	20 January 2004	Pussemier, B

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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A : technological background
O : non-written disclosure
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E : earlier patent document, but published on, or after the filing date
D : document cited in the application
L : document cited for other reasons

& : member of the same patent family, corresponding document

EPO FORM 1503 03.82 (P04C01)

European Patent Office

Application Number
EP 03 10 3517

CLAIMS INCURRING FEES

The present European patent application comprised at the time of filing more than ten claims.

☐ Only part of the claims have been paid within the prescribed time limit. The present European search report has been drawn up for the first ten claims and for those claims for which claims fees have been paid, namely claim(s):

☐ No claims fees have been paid within the prescribed time limit. The present European search report has been drawn up for the first ten claims.

LACK OF UNITY OF INVENTION

The Search Division considers that the present European patent application does not comply with the requirements of unity of invention and relates to several inventions or groups of inventions, namely:

see sheet B

☐ All further search fees have been paid within the fixed time limit. The present European search report has been drawn up for all claims.

☒ As all searchable claims could be searched without effort justifying an additional fee, the Search Division did not invite payment of any additional fee.

☐ Only part of the further search fees have been paid within the fixed time limit. The present European search report has been drawn up for those parts of the European patent application which relate to the inventions in respect of which search fees have been paid, namely claims:

☐ None of the further search fees have been paid within the fixed time limit. The present European search report has been drawn up for those parts of the European patent application which relate to the invention first mentioned in the claims, namely claims:

European Patent Office

LACK OF UNITY OF INVENTION
SHEET B

Application Number
EP 03 10 3517

The Search Division considers that the present European patent application does not comply with the requirements of unity of invention and relates to several inventions or groups of inventions, namely:

1. Claims: 1-11

False selvedge forming device with a drive shaft and a pair of arrays of heddles, connected to each other by a pair of bundles of cords, on the one hand connected to the upper ends of the heddles and on the other hand converging towards two opposite points of a rotating member fixed to the drive shaft, the bottom ends of the heddles being retained by tensioning means.

2. Claims: 12-14

False selvedge forming device with a pair of arrays of heddles, moved by a motor acting on the same proximal end of the heddles, whereby at the opposite distal ends, the first array of heddles is connected to the second array of heddles by reversing means.

ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 03 10 3517

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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20-01-2004

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