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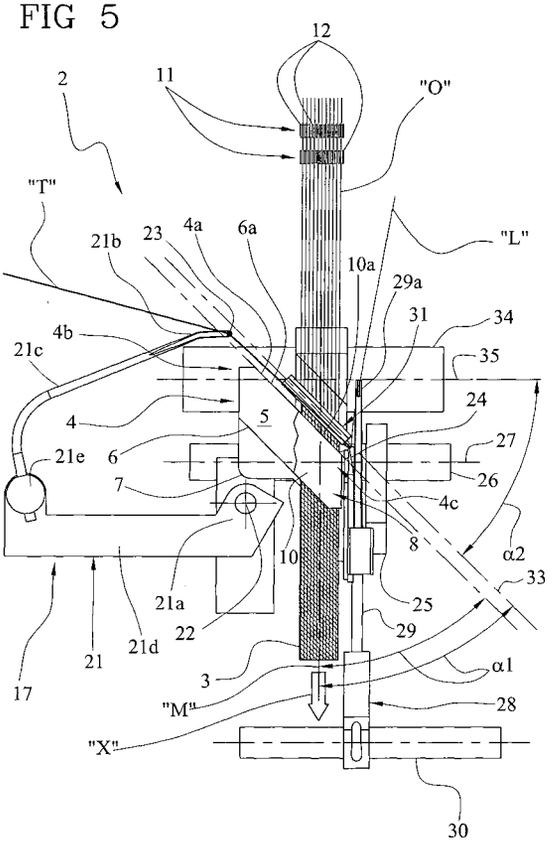
(54) Needle loom

(57) A needle loom comprises at least one forming head (2) for a textile product (3) having a bearing plate (4) defining a predetermined forming plane (5) for the textile product (3) along a predetermined feeding direction (X), at least two heddle frames (11), at least one sickle (17), at least one needle (24) and one reed (31). The reed (31) is movable between a disengagement position and a compacting position, at which it lies in a lying plane (33) substantially transverse to the predetermined forming plane (5), to compact the weft thread (T) against the already formed textile product (3). In the compacting position, the lying plane (33) of the reed (31) and the predetermined feeding direction (X) delimit a predetermined angle (α_1) different from 90°, in the predetermined forming plane.

FIG 5



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Description

[0001] In textile machines formation of a fabric takes place through mutual interlacing of a plurality of warp and weft threads suitably engaged by respective weaving members.

[0002] It is known that textile machines referred to as needle looms comprise one or more forming heads for the textile product at which the warp threads coming from respective beams installed on a rack usually called creel and the weft threads unwound from respective bobbins mounted on a creel dedicated thereto and fed by suitable devices, are interlaced. The needle looms are used to make textile products of indefinite length but with widths in the order of few centimetres, such as ribbons, laces or tapes, shoulder straps, etc.

[0003] Each forming head substantially comprises a bearing plate defining the forming plane of the textile product, at least one pair of heddle frames designed to alternately raise and lower the warp threads fed to the bearing plate, a sickle bringing one or more weft threads between the warp threads in a direction transverse to the warp threads themselves, a needle designed to retain the weft threads before the latter are harnessed between the warp threads by effect of the heddle frame motion, and a reed that, after each passage of the sickle, compacts the weft threads on the already formed textile product. Suitable means disposed downstream of the forming station keep the textile product under tension and allow the same to come out of the loom.

[0004] In looms of the known art, the reed, at least in its compacting position and the edge of the bearing plate faced thereto lie perpendicular to the warp threads of the finished textile product. In addition, the end of the sickle is movable in a direction perpendicular to the warp threads as well.

[0005] By effect of the above described geometry, the weft threads of the finished textile product form angles of 90° with the warp threads.

[0006] This arrangement, in case of use of non-elastic fibres, ensures inextensibility of the textile product in the two, weft and warp, directions perpendicular to each other.

[0007] On the contrary, if the two longitudinal opposite edges of the textile product are grasped and pulled in opposite directions along the longitudinal extension, a shearing force in the plane is exerted that causes sliding of one side of the textile product with respect to the other.

[0008] The above described behaviour is particularly dangerous when the textile product obtained with the needle looms of known type is a ribbon to be used to join two fabrics disposed in side by side relationship.

[0009] In the machines performing this operation, the two fabrics to be joined slide parallel while the junction ribbon is affixed to the union edges disposed in mutual side by side relationship.

[0010] During dragging along of the fabrics in side by side relationship it is possible for one of these fabrics to slide quicker than the other for some instants or to be deformed more than the other in the sliding direction.

[0011] The junction ribbon obtained with needle looms belonging to the known art is therefore submitted to sliding of one side relative to the other, as above specified, and the article of manufacture resulting therefrom has undesirable folds along the junction.

[0012] Accordingly, it is an aim of the present invention to eliminate the above discussed drawbacks by proposing a needle loom capable of producing ribbons with weft threads inclined by a suitable angle to provide the ribbon with particular qualities of strength and stiffness in the preferred directions.

[0013] The foregoing and other aims are substantially achieved by a needle loom comprising the features set out in one or more of the appended claims.

[0014] The description of a preferred embodiment of a needle loom in accordance with the invention is now given by way of non-limiting example, with reference to the accompanying drawings, in which:

- Fig. 1 is a perspective and partly diagrammatic view of a needle loom in accordance with the present invention;
- Fig. 2 shows a detail of the loom in Fig. 1, in a first operating condition;
- Fig. 3 shows a detail in Fig. 2, in a second operating condition;
- Fig. 4 shows the detail in Fig. 3 from a different angle;
- Fig. 5 is a top view of the detail in Fig. 3;
- Fig. 6 is a diagrammatic view of the main elements of the detail shown in Fig. 3; and
- Fig. 7 is a perspective view to an enlarged scale of an element in Fig. 3.

[0015] With reference to the drawings, a needle loom in accordance with the present invention has been generally denoted by reference numeral 1.

[0016] The needle loom 1 comprises a supporting structure, of known type and therefore not illustrated or described in detail, on which at least one forming head 2 of a textile product 3 is mounted. For the sake of clarity, in the accompanying drawings and in the following of the present specification reference is made to a single forming head 2 although the loom 1 preferably supports a plurality of forming heads 2 disposed in mutual side by side relationship, capable of simultaneously producing the same number of textile products 3.

[0017] As better illustrated in Figs. 2 to 5, the forming head 2 comprises a bearing plate 4 that has a predetermined forming plane 5 (Figs. 5 and 6) on which the textile product 3 rests.

[0018] In the preferred embodiment herein illustrated, the predetermined forming plane 5 is embodied by a first plate-like element 6 rigidly mounted on a support 7 installed on the supporting structure (Fig. 5).

[0019] The head 2 further comprises a guide element

8 superposed on the predetermined forming plane 5 and spaced apart therefrom, to delimit a slide channel 9 intended for passage of the formed textile product 3 (Fig. 4).

[0020] In the accompanying figures, the guide element 8 is a second plate-like element 10 of the same shape as the first plate-like element 6 and superposed thereon. The slide channel 9 is a slit delimited by the two plate-like elements 6, 10. The second plate-like element 10 is adjustable in height based on the thickness of the textile product 3.

[0021] Upstream of the bearing plate 4, the forming head 2 has at least two heddle frames 11, preferably a plurality of heddle frames 11. The heddle frame 11 is an element capable of alternately raising and lowering the warp threads "O" engaged by it while they are fed towards the bearing plate 4. Each heddle frame 11 comprises a plurality of heddles 12 each provided with an eye 13 through which a warp thread "O" passes (Figs. 2 and 3). The heddles 12 are mounted on a pair of heddle slide bars 12a (Fig. 1) moved with a reciprocating motion along a direction perpendicular to the forming plane 5. Each heddle frame 11 engages a set of warp threads "O" and is usually moved between two or more operating positions.

[0022] The heddle frames 11 can be guided by a Glider chain or a cam chain connected with a main driving shaft of the loom 1 or by electromechanical actuators operated following preset programs.

[0023] As shown in Fig. 1, the warp threads "O" come from respective beams 13 mounted on a rack 14 for example, that is called creel and are fed by suitable means 15 of known type and therefore not further described, to the bearing plate 4 through the heddle frames 11. In particular, the warp threads "O" pass in the eyes of heddles 12 of the heddle frames 11 and converge towards the slit 9 where, as described in more detail in the following, they are interlaced with at least one weft thread "T" to form the textile product 3.

[0024] More particularly, the warp threads "O" intercepted by a single heddle frame 11 lie in the same plane and the planes identified by the warp threads "O" of the different heddle frames 11 become intersected at the bearing plate 4.

[0025] Downstream of the bearing plate 4, the loom 1 has suitable means 16 keeping the already formed textile product 3 and the warp threads "O" from the heddle frames 11 taut and tensioned, thereby enabling the same to come out.

[0026] The warp threads "O" of the formed textile product 3 therefore identify a predetermined feeding direction "X" of the textile product itself.

[0027] Advantageously, the first plate-like element 6 and the second plate-like element 10 have respective edges 6a, 10a facing the heddle frames 11 and inclined with respect to the predetermined feeding direction "X" by a predetermined angle α_1 advantageously different from 90° (Fig. 5).

[0028] Therefore, more generally, the bearing plate 4 has a respective edge 4a facing the heddle frames 11 and inclined to the predetermined feeding direction "X" by the predetermined angle α_1.

[0029] The forming head 2 further comprises at least one sickle 17 carrying a weft thread "T" or a plurality of weft threads "T", in a transverse direction between the warp threads "O". The weft threads "T" are unwound from respective bobbins 18 mounted on a creel 19 dedicated thereto and fed to the sickle 17 by suitable means 20 of known type and therefore not further described.

[0030] Sickle 17 has a U-shaped arm 21 with a first end 21a hinged around an axis 22 perpendicular to the predetermined forming plane 5 and a second end 21b provided with an eye 23 in which the weft thread "T" passes, said weft thread getting then in engagement with the warp threads "O" at the bearing plate 4.

[0031] Preferably arm 21 consists of two elements 21c, 21d connected by an articulated joint 21e to allow adjustment of the loop opening defined by the U-shaped arm, based on specific requirements.

[0032] Sickle 17 carries out a reciprocating rotatory motion following an arc of a circle so that the eye 23 cyclically moves close to and away from the warp threads "O".

[0033] In particular, the eye 23 is movable between a first position, at which it lies in side by side relationship with a first side end 4b of the bearing plate 4, and a second position at which it lies in side by side relationship with a second side end 4c of the bearing plate 4. During this movement, the eye 23 describes an arc of a circle and fully passes through the width of the textile product 3, substantially moving parallel to and facing the edges 6a, 10a of the first and second plate-like elements 6, 10.

[0034] In fact, advantageously, also the straight line joining the first and second positions of the eye 23 is inclined to the predetermined feeding direction "X" by the predetermined angle α_1.

[0035] For the purpose of obtaining this movement, the hinging axis 22 of the sickle 17 is laterally offset with respect to a longitudinal centre line "M" of the textile product 3 being formed.

[0036] In addition, in the second position taken by the sickle 17, the first and second plate-like elements 6, 10 are disposed within the loop defined by the U-shaped arm.

[0037] At the second side end 4c of the bearing plate 4, the head 2 has at least one movable needle 24 the function of which is to temporarily retain the weft thread "T" brought by the sickle 17 to the second position, on the hook-shaped end 24a of the needle itself.

[0038] The needle 24 moves with respect to the bearing plate 4 along a direction substantially parallel to the predetermined feeding direction "X", between a retracted position, at the first position of the sickle 17, and an advanced position, corresponding to the second position of sickle 17.

[0039] In the preferred embodiment herein illustrated,

the hook-shaped end 24a describes an arc of a circle. In fact, the needle 24 is mounted on an arm 25 extending at right angles to a first shaft 26 installed on the supporting structure so that a longitudinal axis 27 thereof is perpendicular to the predetermined feeding direction "X".

[0040] The first shaft 26 is driven in rotation around its longitudinal axis 27 with a reciprocating motion, through a kinematic connection with the main driving shaft of loom 1, for example.

[0041] A charging device 28 disposed in side by side relationship with needle 24 is used to charge the weft thread "T" onto the hook-shaped end 24a of the needle 24 itself.

[0042] In the embodiment shown in the accompanying figures, the charging device 28 is movable between a first raised position, corresponding to the second position of sickle 17 and to the advanced position of needle 24, and a second lowered position, corresponding to the first position of sickle 17 and to the retracted position of needle 24.

[0043] The charging device 28 comprises a rod 29 extending perpendicular to a second shaft 30 parallel to the first shaft 26 and mounted on the supporting structure.

[0044] The free end 29a of the rod 29 is suitably shaped so as to engage the weft thread "T" and clasp it to the hook-shaped end 24a of needle 24.

[0045] In the embodiment herein illustrated, the free end 29a further has an eye 29b in which an auxiliary binding thread "L" passes; in accordance with a pattern of known type, said auxiliary thread is used to reinforce the longitudinal edge of the textile product 3.

[0046] The forming head 2 finally comprises a reed 31 the dual function of which is to keep the warp threads "O" separated from each other and to tighten the weft threads "T" against the already formed textile product 3, preferably after each passage of sickle 17.

[0047] The reed 31 is installed between the bearing plate 4 and the heddle frames 11 and has a frame 32 of parallel vertical lamellae fastened to a rigid framework. The reed 31 is movable between a disengagement position, at which it lies spaced apart from the bearing plate 4 and the textile product already formed 3, and a compacting position at which it lies close to the bearing plate 4 to compact the weft thread or threads "T".

[0048] In the compacting position, the reed 31 is parallel to and faces the edge 4a of the bearing plate 4 and, as clearly shown in Figs. 5 and 6, it lies in a lying plane 33 substantially transverse to the predetermined forming plate 5.

[0049] Consequently, at least in the compacting position, the lying plane 33 of the reed 31 and the predetermined feeding direction "X" delimit the above mentioned predetermined angle α_1 advantageously different from 90°, in the predetermined forming plane 5.

[0050] Preferably, this predetermined angle α_1 is included between 20° and 70° and more preferably is of 45°.

[0051] In the embodiment shown, the reed 31 is mounted on a movement shaft 34 having a longitudinal rotation axis 35 perpendicular to the predetermined feeding direction "X" of the textile product 3 and parallel to the predetermined forming plane 5 of the textile product 3 itself.

[0052] The movement shaft 34 is therefore parallel to the first 26 and the second 30 shafts setting in motion the needle 24 and the charging device 28, respectively.

[0053] The reed 31 is rigidly mounted on the movement shaft 34 through a support 36 and is movable with a reciprocating motion around the longitudinal rotation axis 35 between the disengagement position and the compacting position.

[0054] Advantageously, in order that the lying plane 33 of the reed 31 and the predetermined feeding direction "X" may delimit the predetermined angle α_1 advantageously different from 90°, in the predetermined forming plane 5, the support 36 has a coupling surface 37 for the reed 30 that is inclined with respect to the longitudinal rotation axis 35.

[0055] As a result, the lying plane 33 of reed 31 and the longitudinal rotation axis 35 of shaft 34 delimit a second angle α_2 that is complementary to said predetermined angle α_1 (Figs. 5 and 6).

[0056] Advantageously, the projections of the reed lamellae 32 in the predetermined forming plane 5 are parallel to the predetermined feeding direction "X". To this aim, as shown in Fig. 7, said lamellae 32 are mounted in an inclined configuration on the rigid framework.

[0057] All movements of the above described elements are mechanically or electrically controlled so that they may take place in synchronism following the operating diagram hereinafter described.

[0058] In use, with reference to the illustrated embodiment, in a first operating step of the needle loom 1, while two sets of warp threads "O" are maintained spaced apart by two heddle frames 11, the sickle 17 is in the first position with the eye 23 in side by side relationship with the first side end 4b of the bearing plate 4 (Fig. 2). Needle 24 is retracted and temporary retains the weft thread "T", the charging device 28 being in the lowered position and the reed 31 being in the compacting position.

[0059] At this point, the heddle frames 11, moved in opposite ways, cause crossing of the two sets of warp threads "O" and interlacing with the weft "T".

[0060] Reed 31 moves to the disengagement position and enables sickle 17 to bring the eye 23 thereof to the second position, close to the second side end 4c of the bearing plate 4 (Figs. 3 and 4). Simultaneously, needle 24 moves to the advanced position, releasing the already interlooped weft thread "T", ready to retain the weft thread "T" again brought by sickle 17.

[0061] Before the sickle 17 goes back to the first position, the charging device 28 rises and its free end 29a engages the weft thread "T" and clasps it to needle 24 during the return stroke of the latter to the retracted po-

sition. Once sickle 17 has gone back to the first position, reed 31 moves towards the bearing plate 4 to compact the new weft course.

[0062] At this point a new operating cycle for making the subsequent weft course begins.

[0063] The textile product 3 obtained with the present needle loom 1 is formed of a succession of weft courses interlooped with the warp threads "O". The weft courses are inclined to the warp threads "O" by an angle different from 90°.

[0064] The invention achieves important advantages.

[0065] In fact, the needle loom in accordance with the present inventions enables ribbons to be made which have weft threads inclined by a suitable angle to provide the ribbon itself with particular qualities of strength and stiffness in preferred directions.

[0066] In particular, the needle loom in accordance with the present invention allows ribbons to be obtained that are particularly suitable for joining fabrics disposed in side by side relationship by means of automatic machines.

Claims

1. A needle loom, comprising:

- a supporting structure;
- at least one forming head (2) for a textile product (3) installed on the supporting structure and having a bearing plate (4) defining a predetermined forming plane (5) for the textile product (3) along a predetermined feeding direction (X), at least two heddle frames (11) to intercept a plurality of warp threads (O) fed towards the bearing plate (4), at least one sickle (17) to bring at least one weft thread (T) transversely between said warp threads (O), at least one needle (24) to temporarily retain said at least one weft thread (T) carried by the sickle (17), and one reed (31) movable between a disengagement position and a compacting position at which the reed (31) lies in a lying plane (33) substantially transverse to the predetermined forming plane (5), to compact said at least one weft thread (T) against the already formed textile product;

characterised in that, at least in the compacting position, the lying plane (33) of the reed (31) and the predetermined feeding direction (X) delimit a predetermined angle (α_1) different from 90° in the predetermined forming plane (5).

2. A loom as claimed in claim 1, **characterised in that** said predetermined angle (α_1) is included between 20° and 70°.

3. A loom as claimed in claim 1, **characterised in that** said predetermined angle (α_1) is equal to 45°.

4. A loom as claimed in anyone of the preceding claims,
characterised in that the bearing plate (4) has an edge (4a) facing the reed (31) and inclined by said predetermined angle (α_1) with respect to the predetermined feeding direction (X).

5. A loom as claimed in claim 4, **characterised in that** the bearing plate (4) further has a guide element (8) superposed on the predetermined forming plane (5) and spaced apart from said predetermined forming plane (5) to delimit a slide channel (9) for the textile product (3); said guide element (8) having a respective edge (10a) facing the reed (31) and inclined by said predetermined angle (α_1) with respect to the predetermined feeding direction (X)

6. A loom as claimed in anyone of the preceding claims,
characterised in that the sickle (17) has an eye (23) for the weft thread (T) that is movable between a first position, at which it lies in side by side relationship with a first side end (4b) of the bearing plate (4), and a second position at which it lies in side by side relationship with a second side end (4c) of the bearing plate (4).

7. A loom as claimed in claim 6, **characterised in that** the straight line joining the first position of the eye (23) to the second position of said eye (23) is inclined with respect to the predetermined feeding direction (X) by said predetermined angle (α_1).

8. A loom as claimed in anyone of the preceding claims,
characterised in that the sickle (17) comprises an arm (21) rotatable about a respective axis (22); said axis (22) being laterally offset with respect to a longitudinal centre line (M) of the textile product (3).

9. A loom as claimed in anyone of the preceding claims,
characterised in that it further comprises a movement shaft (34) having a longitudinal rotation axis (35) perpendicular to the predetermined feeding direction (X) of the textile product (3) and parallel to the predetermined forming plane of said textile product (3); the reed (31) being rigidly mounted on said shaft (34) and being movable about the longitudinal rotation axis (35) between the disengagement position and the compacting position; the lying plane (33) of the reed (31) and the longitudinal rotation axis (35) of the shaft (34) delimiting a second angle (α_2) complementary to said predetermined angle (α_1).

10. A textile product obtained with a needle loom as claimed in anyone of claims 1 to 9.

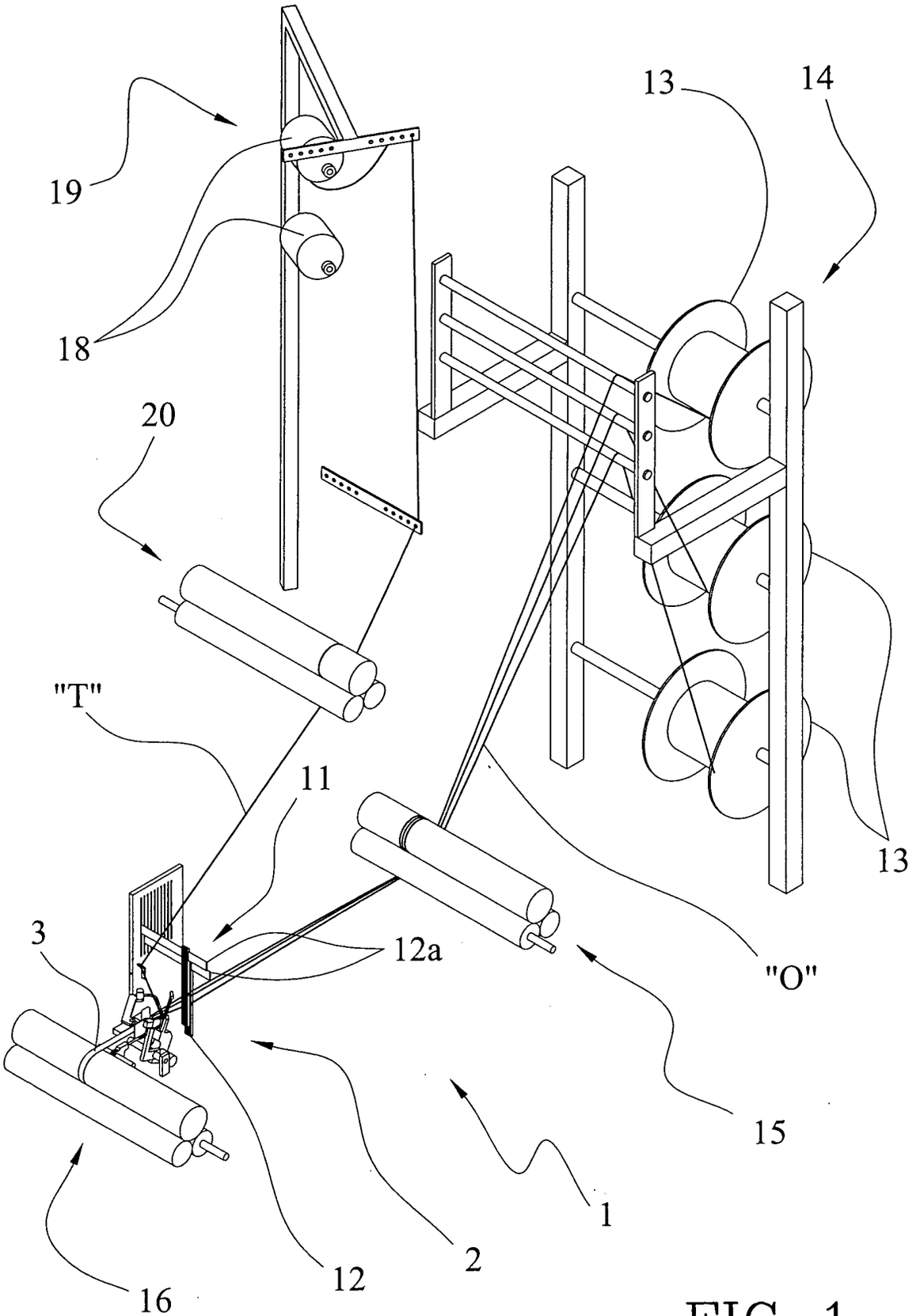
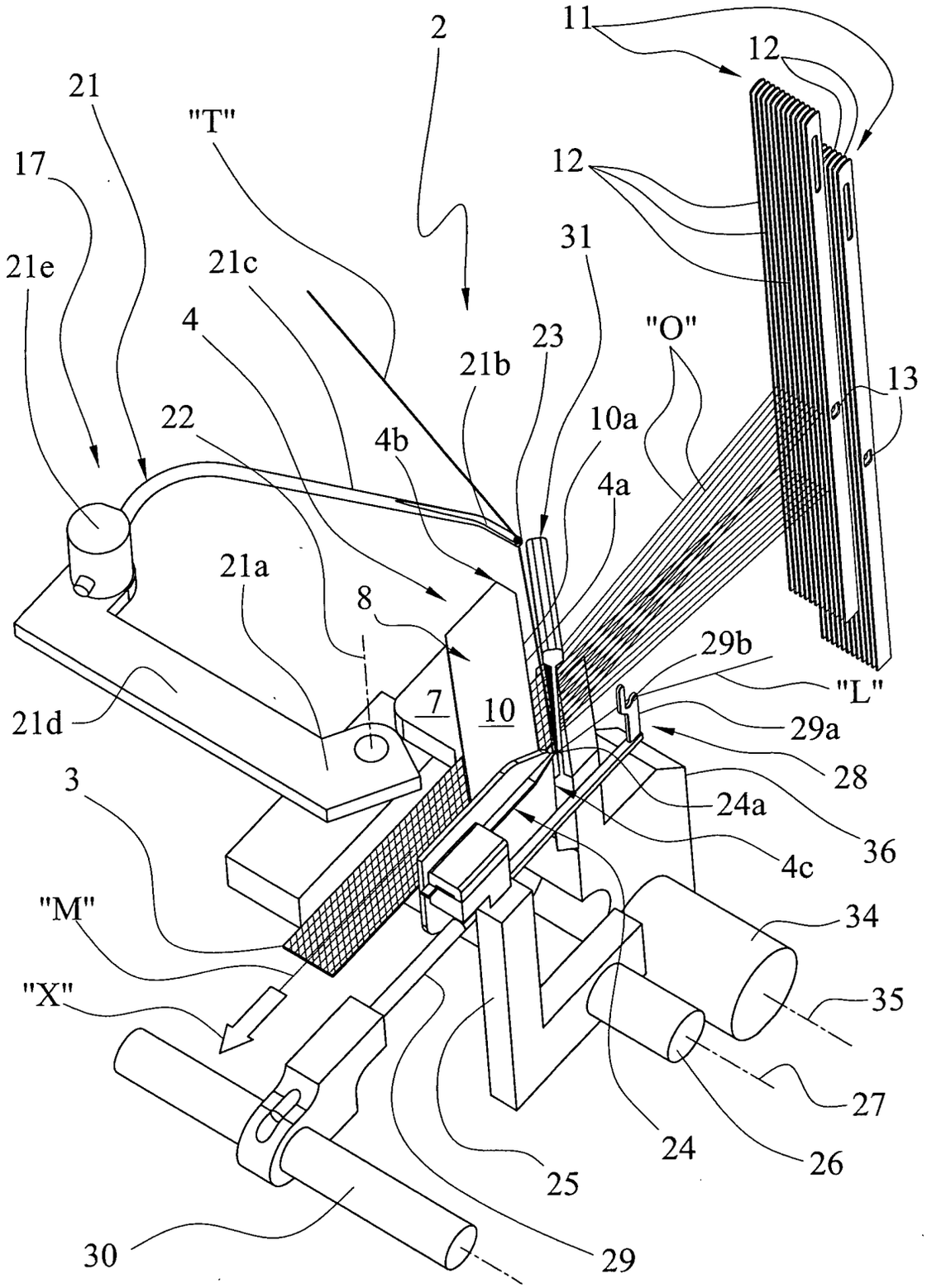


FIG 1

FIG 2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12
2
21
"T"
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21e
21c
4
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"O"
21b
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4a
21a
8
29b
"L"
7
10
21d
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"X"
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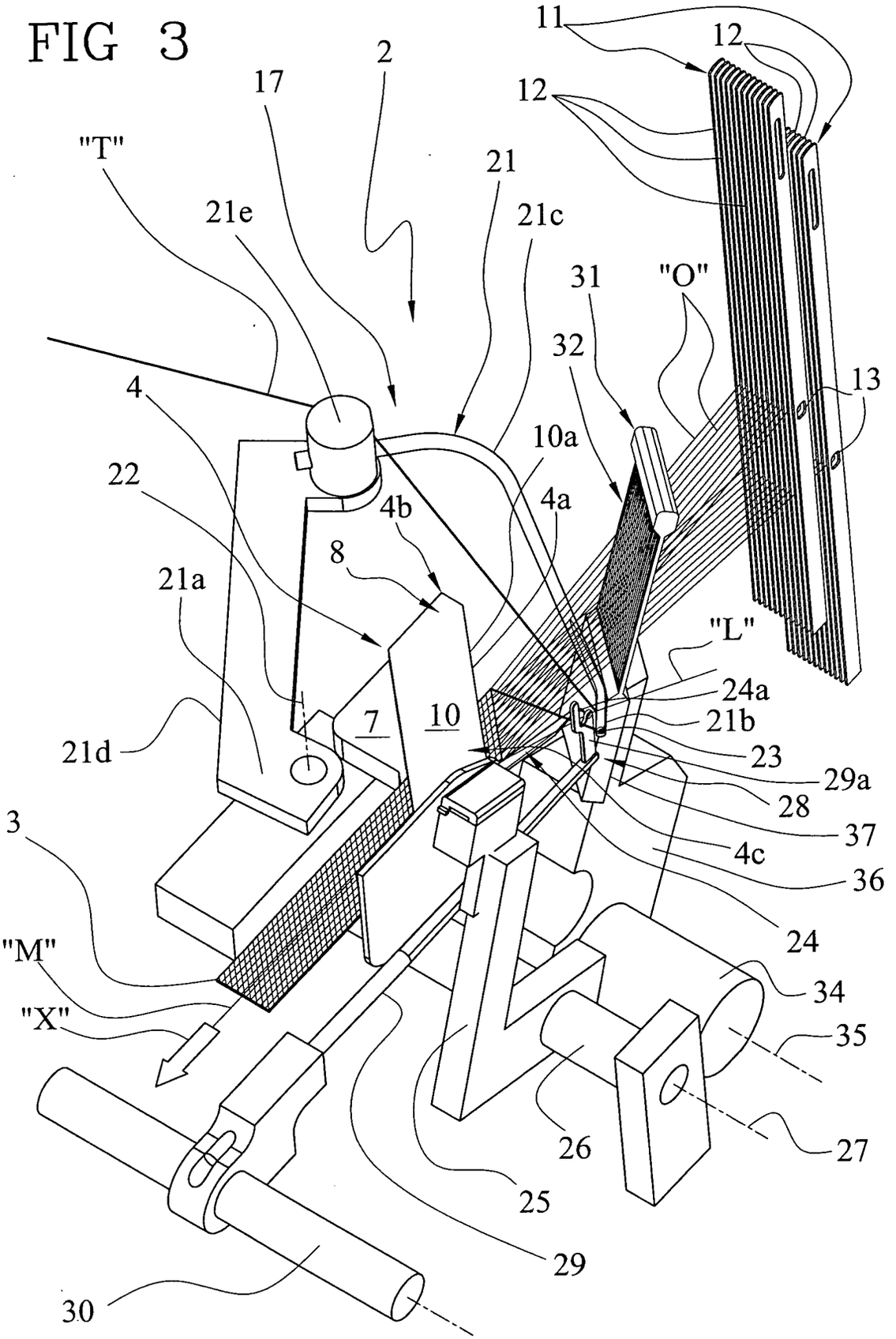
FIG 3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21a
"L"
24a
21b
7
10
21d
23
29a
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37
3
4c
36
24
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"X"
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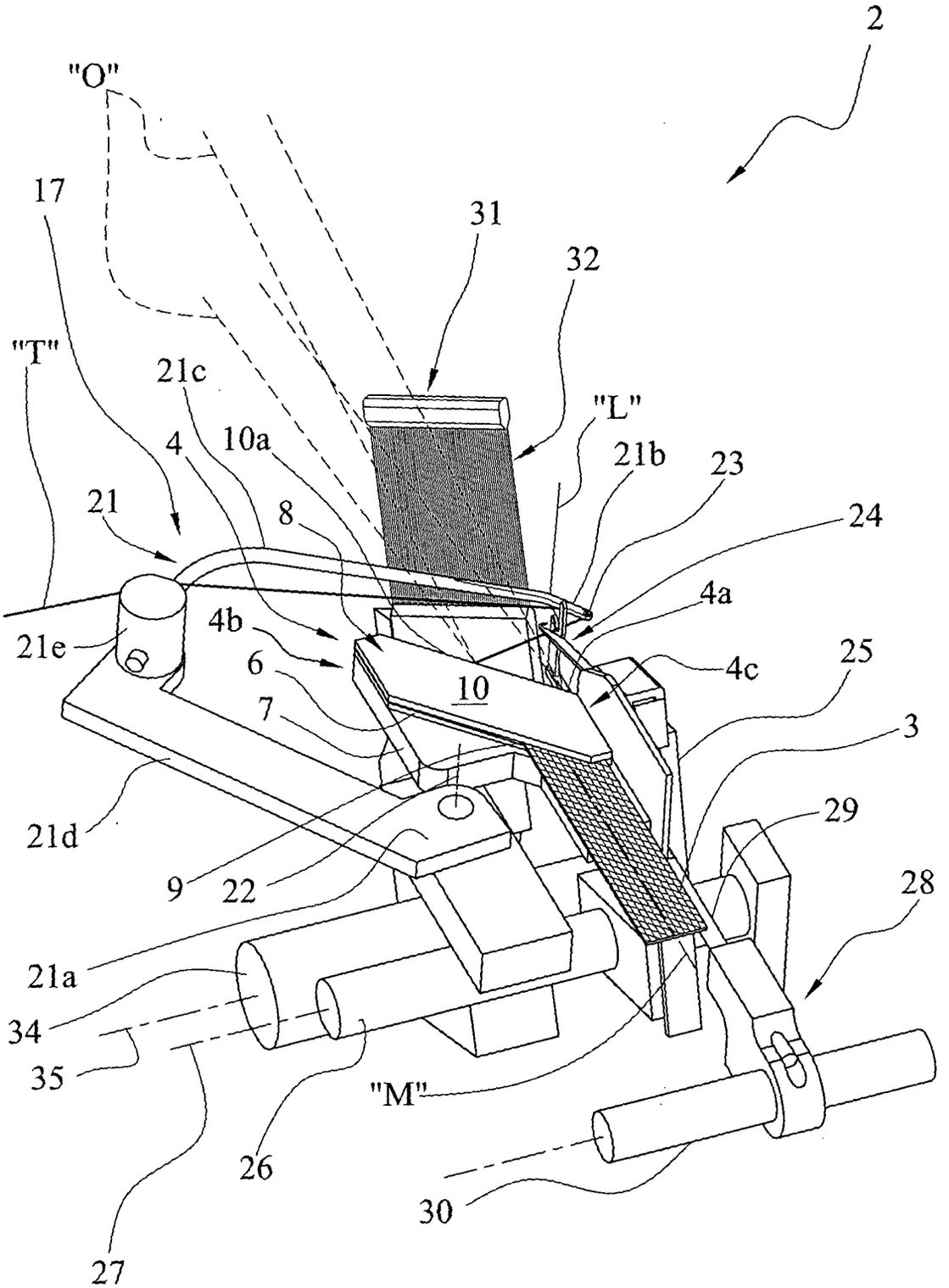
FIG 4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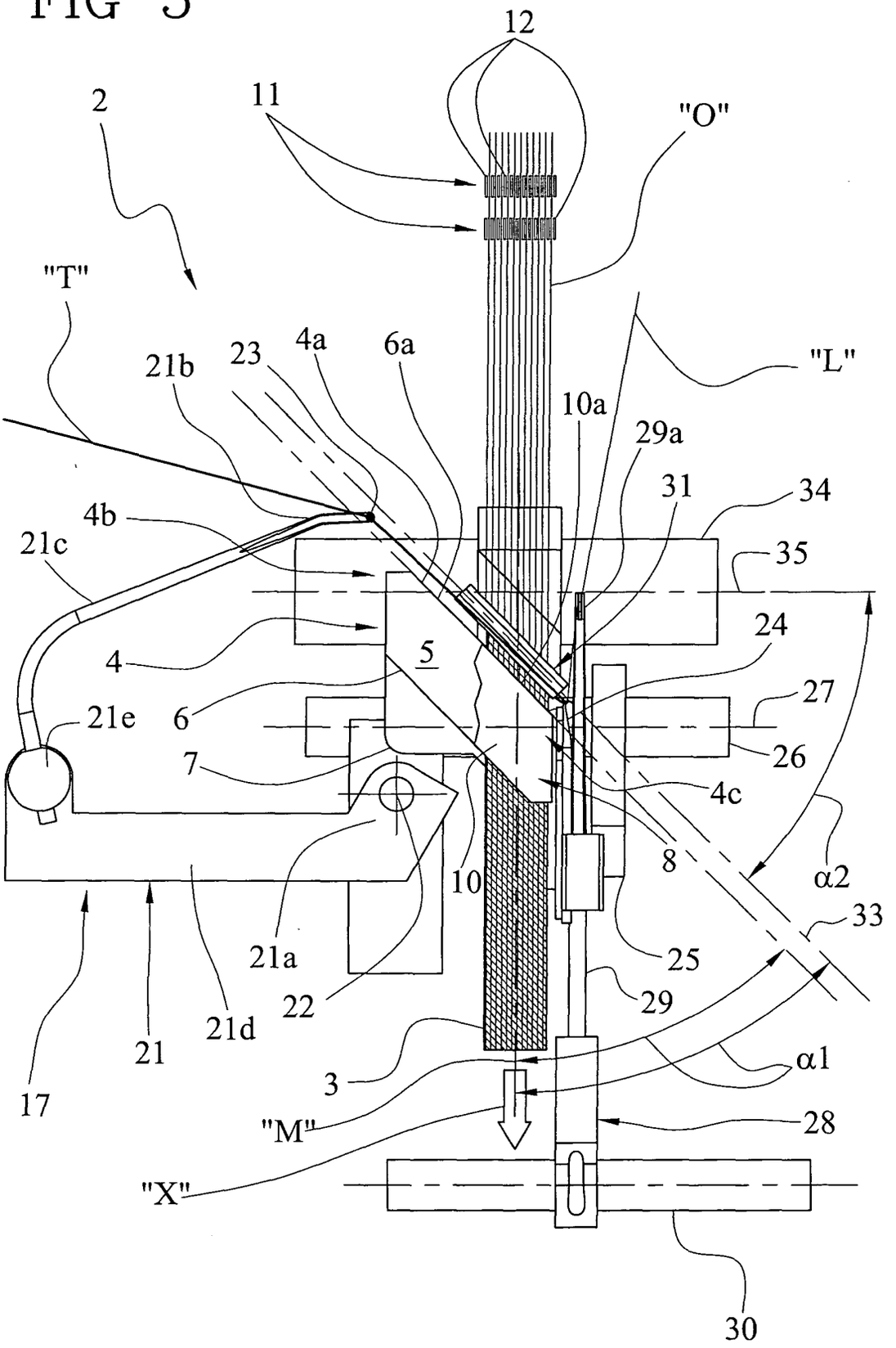
27

FIG 5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24
4
5
27
6
21e
26
7
4c
8
α2
10
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21a
25
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29
21
21d
α1
3
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"M"
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"X"
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FIG 6

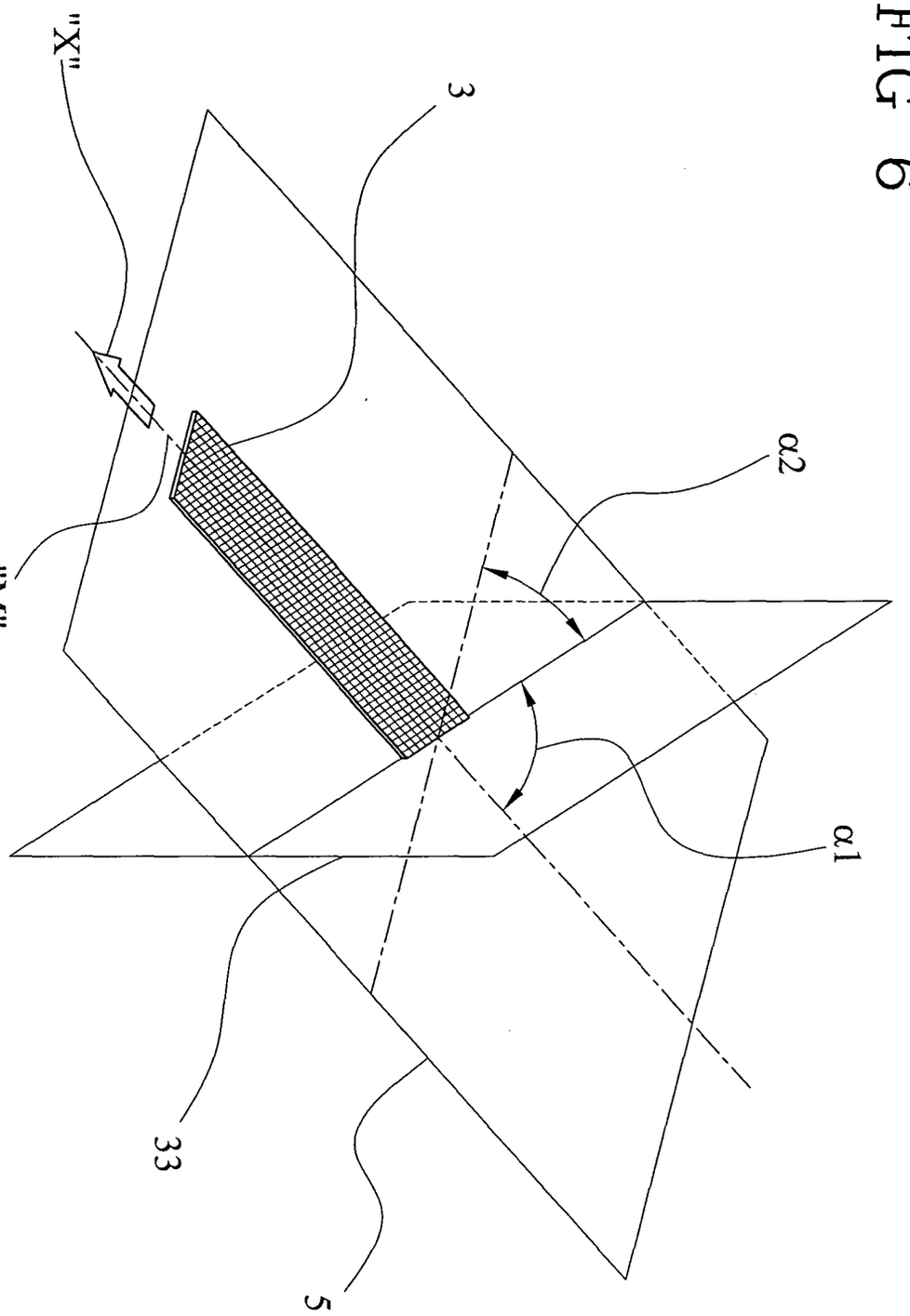
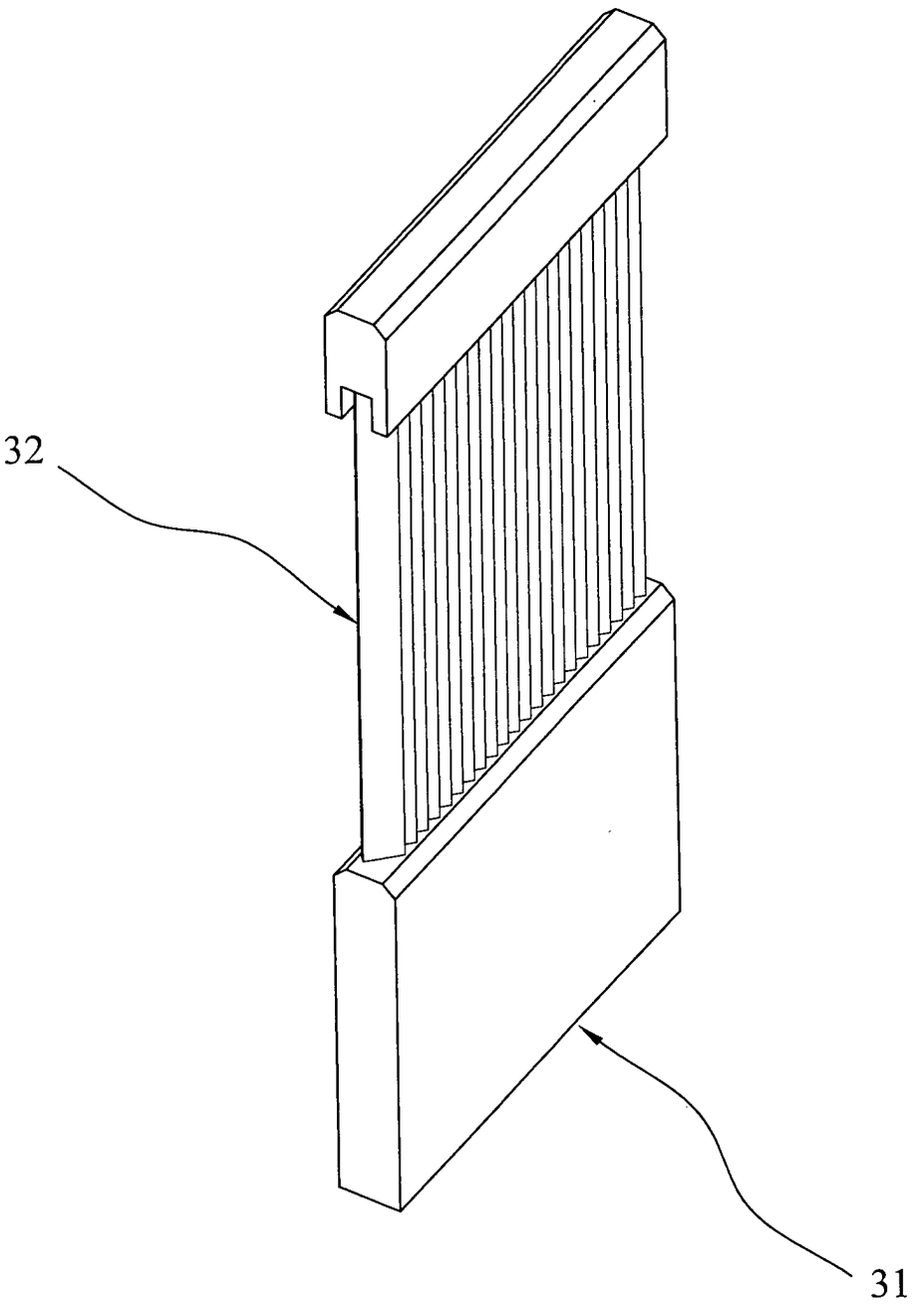


FIG 7



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EUROPEAN SEARCH REPORT

Application Number
EP 04 42 5386

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)
Y	US 4 640 317 A (CHARDON GEORGES ET AL) 3 February 1987 (1987-02-03) * the whole document *	1-10	D03D13/00 D03D35/00 D03D49/60
Y	FR 2 499 107 A (BRUNON ANC TISSAGES ANDRE) 6 August 1982 (1982-08-06) * page 3 - page 4; figures 5-8 *	1-10	
A	WO 00/56965 A (BRUYERE ALAIN ; PERRET FRANCK (FR); HEXCEL FABRICS (FR); DEBAILLE CHRI) 28 September 2000 (2000-09-28) * the whole document *	1-10	
A	GB 1 525 134 A (YOSHIDA KOGYO KK) 20 September 1978 (1978-09-20) * abstract *	1-10	
A	GB 2 146 665 A (BONAS MACHINE CO) 24 April 1985 (1985-04-24) * the whole document *	1-10	
A	US 5 564 477 A (PROBST ANTON) 15 October 1996 (1996-10-15) * the whole document *	1-10	TECHNICAL FIELDS SEARCHED (Int.Cl.7) D03D
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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	8 November 2004	Pussemier, B

CATEGORY OF CITED DOCUMENTS

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08-11-2004

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