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(54) Title: NEEDLE FOR TRANSFERRING STITCHES FROM THE NEEDLE ITSELF TO ADJACENT NEEDLES FOR HOSIERY KNITTING MACHINES OR THE LIKE

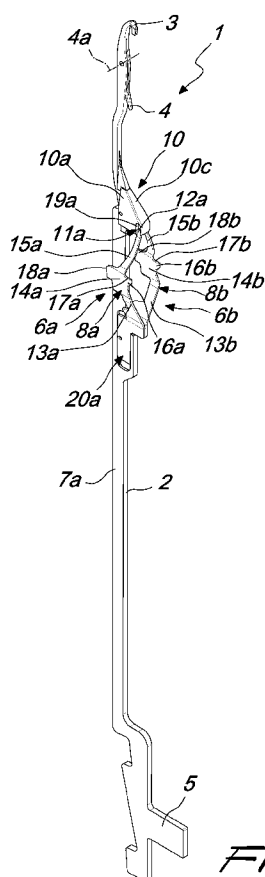


Fig. 1

(57) Abstract: A needle for transferring stitches therefrom to adjacent needles for knitting machines for hosiery or the like, comprising a shank (2), a head (3) that is hooked and arranged at a longitudinal or upper end of the shank (2), and a latch (4), pivoted to the shank (2) proximate to the head (3), perpendicularly to the longitudinal axis of the shank (2), in order to open or close the head (3), at least one lamina (6a, 6b) being connected to the shank (2) and having, on opposite sides, below the latch (4), a flexible portion (8a, 8b) that flexes in active and inactive positions to produce, in the active position, an expansion of the loop (9) of knitting fitted onto the shank (2), the head (3) of an adjacent needle (1b) being insertable in the space comprised between the portion of the lamina (6a, 6b), in the active position, and the corresponding side (7a, 7b) of the shank (2), in order to pick up the loop (9) of knitting with the adjacent needle (1b), the shank (2) having further between the latch (4) and the end of the portion of the lamina (6a, 6b) towards the head (3), a region (10) for blending the shank (2) with the portion (8a, 8b) of the lamina (6a, 6b).



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NEEDLE FOR TRANSFERRING STITCHES FROM THE NEEDLE ITSELF TO ADJACENT NEEDLES FOR HOSIERY KNITTING MACHINES OR THE LIKE

Technical Field

- 5 The present invention relates to a needle for transferring stitches from the needle itself to adjacent needles for knitting machines for hosiery or the like.

Background Art

- In the field of knitting machines for hosiery or the like, needles are
10 known which are provided in order to allow to transfer a stitch or loop of knitting from one needle to an adjacent needle arranged in the same bed.

 One of these needles is shown, for example, in WO-02/070799. A needle of this kind allows to transfer the stitch exclusively onto the needle that is arranged on one side of the needle that has to release the stitch.

- 15 WO2007/057041 by the same Applicant, assumed included herein as reference, illustrates a needle that is capable of transferring, according to the requirements, the stitch onto the needle that is arranged on one side or to the needle that is arranged on the opposite side of the needle that has to release the stitch.

- 20 Substantially, the needle according to WO2007/057041 comprises: a shank, a head arranged at a longitudinal or upper end of the shank, and a latch that is hinged to the shank proximate to the head, about a pivoting axis that is substantially perpendicular to the longitudinal axis of the shank and can rotate about said pivoting axis in order to open or close the head. The
25 needle comprises at least one elastically flexible lamina, which is associated with the shank and defines, on the two opposite sides of the shank, below the latch, two receptacles, one for each side of the shank. It is possible to insert in each of these receptacles the head of an adjacent needle in order to transfer the loop of knitting, carried by the shank and arranged at the
30 receptacles, from said needle to the adjacent needle.

This needle, during testing, has proved to be susceptible of improvements aimed mainly at reducing the stresses of the elastically flexible lamina and of the loop of knitting when, as a consequence of the longitudinal movement of the needle, the lamina enters the loop carried by the shank in order to widen it and facilitate the movement of the lamina toward the shank after releasing the loop of knitting to the adjacent needle.

Disclosure of the Invention

The aim of the present invention is to provide a needle for transferring stitches from said needle to adjacent needles for knitting machines for hosiery or the like that reduces the extent of the stresses induced by the loop of knitting on the elastically flexible lamina and vice versa during the insertion of the latter in the loop of knitting in order to widen it in preparation for the transfer of the loop of knitting to an adjacent needle.

Within this aim, an object of the invention is to provide a needle which, by reducing the stresses transmitted to the elastically flexible lamina, reduces the danger of abnormal or irregular deformations of the lamina that might compromise the transfer of the loop of knitting to the adjacent needle.

Another object of the invention is to provide a needle that allows the most gradual possible widening of the loop of knitting that must be transferred, so as to also reduce the danger of breakage of the loop of knitting.

Another object of the invention is to provide a needle that is capable of cooperating in producing the flexing of the lamina toward the shank of the corresponding needle after the loop of knitting has been transferred from one needle to the adjacent needle.

Still another object of the invention is to provide a needle that can have a reduced thickness, so as to allow its use on high-fineness machines, particularly in machines with more than 12 needles per inch.

This aim, as well as these and other objects that will become better

apparent hereinafter, are achieved by a needle for transferring stitches from said needle to adjacent needles for knitting machines for hosiery or the like, comprising a shank, a head that is arranged at a longitudinal or upper end of said shank and is contoured like a hook that is open toward the front side of said shank, and a latch, which is pivoted to said shank proximate to said head, about a pivoting axis that is substantially perpendicular to the longitudinal axis of said shank, and rotatable about said pivoting axis in order to open or close said head, characterized in that it comprises at least one lamina that is connected to said shank and has, on each of the two opposite sides of said shank, below said latch, a portion that can flex elastically from an inactive position, in which it is closer to the corresponding side of the shank, to an active position, in which it is spaced from the corresponding side of the shank; in said active position, said elastically flexible portion of the lamina producing an expansion of the loop of knitting that is fitted onto said shank at said elastically flexible portion of the lamina, the head of an adjacent needle being insertable in the space comprised between said elastically flexible portion of the lamina, in said active position, and the corresponding side of said shank, in order to pick up said loop of knitting by means of said adjacent needle; said shank having, between said latch and the end of said elastically flexible portion of the lamina that is directed toward said head, a region for blending said shank with said elastically flexible portion of the lamina.

Brief description of the drawings

Further characteristics and advantages of the invention will become better apparent from the description of a preferred but not exclusive embodiment of the needle according to the invention, illustrated by way of non-limiting example in the accompanying drawings, wherein:

Figure 1 is a perspective view of the needle according to the invention, with the elastically flexible portions of the lamina in the active position;

Figure 2 is a front elevation view of the needle of Figure 1;

Figure 3 is a perspective view of the needle according to the invention, with the elastically flexible portions of the lamina in the inactive position;

5 Figure 4 is a front elevation view of the needle of Figure 3;

Figure 5 is a perspective view of the transfer of a loop of knitting from one needle to an adjacent needle;

Figure 6 is a front elevation view of the transfer of the loop of knitting from one needle to an adjacent needle;

10 Figures 7 and 8 are perspective views of the transition of the elastically flexible portions of the lamina from the active position to the inactive position during the longitudinal movement of one needle with respect to two adjacent needles;

Figure 9 is a schematic view of a portion of the needle cylinder of a circular knitting machine extended flat and equipped with needles according to the invention;

Figure 10 is a perspective view of a constructive variation of the needle according to the invention.

Ways to carrying out the Invention

20 With reference to Figures 1 to 9, the needle according to the invention, generally designated by the reference numeral 1, comprises: a shank 2, which has an elongated shape, a head 3 and a latch 4.

The head 3 is arranged at a longitudinal end or upper end of the shank 2 and is shaped like a hook that is open toward the front side of the shank 2, in a manner similar to known types of needles.

The latch 4 is hinged to the shank 2 proximate to the head 3, about a pivoting axis 4a that is substantially perpendicular to the longitudinal axis of the shank 2, and rotatable about the pivoting axis 4a to open or close the head 3, as in known types of needles.

30 The shank 2 has, along its extension, on its front side and proximate

to its longitudinal end, or lower end, that lies opposite with respect to the head 3, at least one heel 5, which protrudes from its front side and can engage in a per se known manner the needle actuation cams provided in the knitting machine for hosiery or the like on which the needle 1 is to be fitted.

5 The needle according to the invention comprises at least one lamina 6a, 6b, which is connected to the shank 2 and has, at each of the two opposite sides 7a, 7b of the shank 2, below the latch 4, a portion 8a, 8b, which is elastically flexible from an inactive position, in which it is close to the corresponding side 7a or 7b of the shank 2, as shown in Figures 3 and 4,
10 to an active position, in which it is spaced from the corresponding side 7a or 7b of the shank 2, as shown in Figures 1 and 2. In the active position, said portion 8a, 8b widens the loop of knitting 9 fitted on the shank 2 at said portion 8a, 8b of the lamina 6a, 6b and, in the space comprised between the portion 8a, 8b of the lamina 6a, 6b and the corresponding side 7a, 7b of the
15 shank 2, when the portion 8a, 8b is in the active position, it is possible to insert the head 3 of an adjacent needle 1b to pick up the loop of knitting 9 by means of said adjacent needle 1b, as will become better apparent hereinafter. The shank 2, between the latch 4 and the end of the portion 8a, 8b of the lamina 6a, 6b that is directed toward the head 3, has a region 10
20 for blending the shank 2 with the portion 8a, 8b of the lamina 6a, 6b.

More particularly, without altering the fact that the portions 8a, 8b can be part of a single lamina that is shaped conveniently so as to arrange the portion 8a on one side 7a of the shank 2 and the portion 8b on the opposite side 7b of the shank 2, preferably there are two laminas 6a, 6b, one
25 for each side 7a, 7b of the shank 2, which are fixed, at their end directed toward the lower end of the shank 2, to the corresponding side 7a, 7b of the shank 2.

The laminas 6a, 6b are extended toward the head 3 and rest, with their end directed toward the head 3, against the corresponding side 7a, 7b of the
30 shank 2.

Each of the laminas 6a, 6b has the respective portion 8a, 8b that can flex elastically toward or away from the corresponding side 7a, 7b of the shank 2. Each portion 8a, 8b can flex elastically toward the corresponding side 7a, 7b of the shank 2 in contrast with its elastic reaction, so as to move,
5 in the absence of forces that act thereon, to the active position.

Each lamina 6a, 6b is contoured so as to have: a lower region 20a, 20b, which lies so as to adhere to the corresponding side 7a, 7b of the shank 2 and is fixed thereto; an intermediate region, which constitutes the portion 8a, 8b; and an upper region 11a, 11b, which ends with the upper end 12a,
10 12b or which, as in the illustrated embodiment, is limited to said upper end 12a, 12b that rests against the corresponding side 7a, 7b of the shank 2.

The intermediate region, which constitutes the portion 8a, 8b that can flex elastically toward and away from the corresponding side 7a, 7b of the shank 2, is preferably constituted, starting from its lower end and in the
15 absence of forces acting thereon: by a first segment 13a, 13b, which is folded away from the corresponding side 7a, 7b of the shank 2; by a second segment 14a, 14b, which is substantially parallel to the corresponding side 7a, 7b of the shank 2; and by a third segment 15a, 15b, which is folded toward the corresponding side 7a, 7b of the shank 2.

20 Each portion 8a, 8b has, on its front side, a front protrusion 16a, 16b that defines, with its upper profile, a supporting shoulder 17a, 17b for the loop of knitting 9.

Moreover, each portion 8a, 8b has, on its rear side, a rear protrusion 18a, 18b that can engage by resting against the head 3 of an adjacent needle
25 1a, 1b.

The lower region 20a, 20b of the lamina 6a, 6b is fixed to the side 7a, 7b at an appropriately provided recess and the portion 8a, 8b is shifted forward with respect to said lower region 20a, 20b.

The blending region 10 is shaped like a wedge that tapers toward the
30 head 3.

The region of the needle 1 that is occupied by the portions 8a, 8b of the laminas 6a, 6b has, along the anteroposterior direction, an increased space occupation toward the front side of the needle with respect to the contiguous regions of the shank 2. The blending region 10 has a front face
5 10c, which is inclined with respect to the longitudinal axis of the shank 2 so as to blend said region occupied by the portions 8a, 8b of the laminas 6a, 6b with the portion of the shank 2 that is arranged above.

Said front face 10c of the blending region 10 has a curved lower segment that blends it with its base side.

10 Moreover, the blending region 10 is delimited laterally by sides 10a, 10b that are shaped, at least for a segment starting from their upper end, like a plane that is inclined with respect to the longitudinal axis of the shank 2 and move mutually closer progressively toward the head 3.

Conveniently, the lower end of the blending region 10 is wider than
15 the distance between the two opposite sides 7a, 7b of the shank 2 in regions that are contiguous to the blending region 10.

The upper end 12a, 12b of each lamina 6a, 6b, i.e., the end that is directed toward the head 3, is connected to the blending region 10 proximate its base.

20 More particularly, the upper end 12a, 12b of each lamina 6a, 6b rests, so that it can slide parallel to the longitudinal axis of the shank 2, in a recess 19a, 19b formed in the corresponding side of the blending region 10.

The blending region 10 can be formed at least partly by a block that is fixed to the shank 2, as in the embodiment shown in Figures 1 to 9. In this
25 embodiment, the upper part of the blending region 10 is formed directly in the shank 2, while the remaining part of the blending region 10 is obtained, as a continuation of the upper part, in a block that is fixed rigidly to the shank 2.

As an alternative, the blending region 10 can be obtained
30 monolithically with the shank 2, as in the constructive variation of the

needle according to the invention shown in Figure 10.

In this constructive variation, the elements of the needle that correspond to the elements that have already been described with reference to Figures 1 to 9 have been designated by the same reference numerals.

5 Differently from the embodiment shown in Figures 1 to 9, in the embodiment shown in Figure 10 the upper ends 12a, 12b of the portions 8a, 8b of the laminas 6a, 6b are inserted slidably within a slot 19 that is open at the front and in a downward region proximate to the base of the blending region 10.

10 In this constructive variation, owing to the fact that the sides 10a, 10b of the blending region are further retracted toward the rear side of the shank 2 with respect to what is provided in the embodiment shown in Figures 1 to 9, the first segment 13a, 13b of the portion 8a, 8b of the laminas 6a, 6b has a rear protrusion 22a, 22b, so as to allow said first portion 13a, 13b to engage
15 in any case the sides 10a, 10b of the blending regions 10 of adjacent needles, provided like the needle 1, as a consequence of a longitudinal movement of the needle 1 with respect to the adjacent needles.

By equipping a knitting machine for hosiery or the like with needles according to the invention and by providing for them an actuation as
20 described hereafter, it is possible to transfer directly stitches or loops of knitting 9 from one needle 1 to a needle 1a or 1b that is adjacent and arranged laterally, on either side, with respect to the needle 1, without requiring additional elements that pick up the stitch or loop of knitting 9. For the sake of greater clarity, the needles that are adjacent to the needle 1,
25 which must release the stitch or loop of knitting, have been designated by the reference numerals 1a, 1b, but can be provided, as shown, like the needle 1 described up to now.

In the description that follows, which will reference Figures 5 and 6, it is assumed that the needle 1, arranged between the needles 1b, 1a, is the
30 needle that carries the loop of knitting 9 and must release it to the adjacent

needle 1b, while the other needle 1a, arranged on the opposite side with respect to the needle 1b relative to the needle 1, is not affected by the transfer of the loop of knitting 9. The needle 1 is referenced hereinafter also as "releasing needle", the needle 1b is also referenced as "receiving needle" and the needle 1a is also referenced as "inactive needle".

The description of the execution of the transfer of a loop of knitting 9 from a needle 1 to an adjacent needle 1b is performed, for the sake of greater clarity, with reference to a circular knitting machine for hosiery or the like, assuming that the needles between which the loop of knitting 9 is transferred are located in the needle cylinder of the machine, without altering the fact that the needle according to the invention can also be used in the dial of circular machines with cylinder and dial, or, more generally, on single and two-bed rectilinear or circular machines.

To transfer the loop of knitting 9 from one needle 1 to an adjacent needle 1b, the needle 1, after forming the loop of knitting 9 and after knocking over the loop of knitting formed previously, is raised, by means of the needle actuation cams with which its heel 5 engages, so as to protrude for a segment above the knitting formation plane 21, which, as is known, is formed by the sinkers, not shown for the sake of simplicity, which retain the loops of knitting 9 that have just been formed. The extent of the lifting of the needle 1, which must release the loop of knitting 9, is such as to bring the portion 8a, 8b of the laminas 6a, 6b at the knitting formation plane 21 and extract the portion 8a, 8b completely from the region that is occupied by the so-called "strips" that delimit laterally the axial slots of the lateral surface of the needle cylinder in which the needles slide. In this manner, the laminas 6a, 6b, first pressed against the shank 2 of the releasing needle 1 by the presence of the strips, move away by elastic reaction from the shank 2 with their portion 8a, 8b, which thus passes into the active position. As a consequence of the lifting of the releasing needle 1, the shank 2 of the needle 1 slides within the loop of knitting 9 which, being crossed first by the

blending region 10 and then by the portion 8a, 8b of the laminas 6a, 6b up to the resting shoulder 17a, 17b, is widened progressively in a manner in which it is suitable to be crossed at least by the receiving needle 1b. In this step, the presence of the blended region 10 ensures a gradual expansion of the loop of knitting 9, avoiding excessive stresses both of the loop and of the laminas 6a, 6b.

At this point, the receiving needle 1b, onto which the loop of knitting 9 is to be transferred, is moved upward with respect to the releasing needle 1, so as to insert its open head 3 in the space comprised between the portion 8a, 8b and the shank 2 of the releasing needle 1. It should be noted that the receiving needle 1b, in this lifting, is arranged with its head 3 between the rear protrusion 18b and the side 7b of the shank 2 of the releasing needle 1. Thanks to this fact, the receiving needle 1b prevents the portion 8b of the lamina 6b from being crushed completely by the loop of knitting 9 against the side 7b of the shank 2 of the releasing needle 1 and the first segment 13b assuredly keeps open the latch of the receiving needle 1b. The inactive needle 1a is in a lower position with respect to the position occupied by the receiving needle 1b, but its head 3 is in any case preferably arranged between the rear protrusion 18a and the side 7a of the shank 2 so as to not interfere with the process for transferring the loop of knitting 9.

Subsequently, after completing the lifting of the receiving needle 1b until its head 3 lies above the knitting formation plane 21 and therefore above the loop of knitting 9 to be engaged, the releasing needle 1 is lowered and the receiving needle 1b is lifted, preferably to the position that corresponds to the held-stitch position.

The descent of the releasing needle 1 moves the receiving needle 1b so that it protrudes with its head upward from the portion 8b of the lamina 6b. Moreover, the descent of the needle 1 causes the loop of knitting 9, arranged around the laminas 6a, 6b, to slide along the third segment 15b of the portion 8b, moving it toward the shank 2 and bringing it into the head of

the receiving needle 1b.

When, in its descent, the releasing needle 1 has moved with its latch beyond the loop of knitting 9, which is in the head of the receiving needle 1b and causes the closing of the head 3 of the releasing needle 1 by the latch
5 4, the two needles 1 and 1b can be lowered together below the knitting formation plane 21. During this lowering, the portions 8a, 8b of the laminas 6a, 6b, by engaging the strips, are moved into the inactive position.

It should be noted that the presence of the resting shoulder 17a, 17b allows to transfer loops of knitting 9 even above the knitting formation
10 plane 21, since said supporting shoulder 17a, 17b achieves by itself the correct positioning of the loop of knitting 9 to transferred, avoiding its descent along the shank 2 of the releasing needle 1.

In this case, the passage of the portions 8a, 8b of the laminas 6a, 6b from the active position to the inactive position after the transfer of the loop
15 of knitting 9 can be achieved following the descent of the releasing needle 1 between the adjacent needles 1a, 1b, since the first segment 13a, 13b of the portions 8a, 8b of the laminas 6a, 6b engages the sides 10a, 10b of the blending region 10, as shown in Figures 7 and 8.

The inactive needle 1a, which does not take part in the transfer of the
20 loop of knitting 9, can be used to reduce the extent of the elastic deformation of the portion 8a of the lamina 6a of the adjacent releasing needle 1 away from the corresponding side 7a of the releasing needle 1, so as to reduce the stresses to which the loop of knitting 9 to be transferred and the other lamina 6b are subjected. This can be achieved by limiting the front
25 extension or eliminating the upper portion of the strips directly below the knitting formation plane 21, so that the portions 8a, 8b of the laminas 6a, 6b of the various needles can move, by elastic reaction, into the active position even without being extracted upward with respect to the knitting formation plane 21 and by positioning beforehand the needle 1a with its blending
30 region 10 at the portion 8a of the lamina 6a of the adjacent releasing needle

1, so as to limit or prevent, as a consequence of the engagement of the blending region 10 of the inactive needle 1a with the portion 8a of the lamina 6a of the releasing needle 1, the flexing of the portion 8a of the lamina 6a away from the side 7a of the shank 2. Subsequently, the releasing
5 needle 1 and the inactive needle 1a are lifted together, so that the releasing needle 1 slides within the loop of knitting 9 until it is moved against the resting shoulder 17b of the lamina 6b, whose portion 8b is in the active position, while the contact of the blending region 10 of the inactive needle 1a continues to limit the spacing of the portion 8a of the lamina 6a from the
10 side 7a of the releasing needle 1. This possibility to use the inactive needle 1a is shown in Figure 9, which illustrates the sequence of actuation, in the direction indicated by the arrow 30, of set of three needles 1, 1a, 1b. In said figure, for the sake of simplicity, the needles have all been shown with the corresponding latch 4 open, without altering the fact that the latch 4 is open
15 or closed on the head 3 of the needles depending on the operating conditions of the needles.

In order to transfer the loop of knitting 9 not to the adjacent needle 1b arranged to the right of the needle 1, but to the adjacent needle arranged to the left in the figures, it is sufficient to actuate said needle arranged to the
20 left as described above with reference to the receiving needle 1b.

Of course, if the needles according to the invention are used in a dial of a machine with cylinder and dial, the needles are moved radially outward instead of being raised and radially inward instead of being lowered.

The adaptation of the movements to be imparted to the needles
25 according to the invention with reference to the machine on which they are mounted can be derived in any case straightforwardly on the basis of the explanation given above with reference to a single-bed circular machine.

The particular structure of the needle according to the invention allows to provide said needle according to the invention with a reduced
30 thickness, such as to allow its use in machines with high fineness (higher

than 18 needles per inch).

It should be noted that the needle according to the invention can be used advantageously also on double-bed machines to transfer a stitch from one bed to the other also with transfer from one needle of one bed to an
5 adjacent needle of the same bed without requiring relative movements between the beds and therefore avoiding the problems of precision and complexity in execution that these movements entail.

Moreover, the use of needles according to the invention with the possibility to transfer the stitches from either side of the needles on
10 machines that can be actuated with a reciprocating motion allows to produce items of knitting with knitted regions of any shape with increasing or decreasing stitches, increasing their quality and degree of finish.

In practice it has been found that the needle according to the invention fully achieves the intended aim, since it allows to perform direct
15 transfer of a stitch from said needle to one of the two adjacent needles, i.e., in either direction, and the presence of the blending region achieves a gradual expansion of the loop of knitting to be transferred, avoiding excessive stresses both of the loop of knitting and of the elastically flexible laminas.

Moreover, said blending region can be used to actuate the transition
20 from the active position to the inactive position and to limit or block the elastic deformation away from the corresponding side of the needle of the elastically flexible portions of the laminas of adjacent needles.

The needle thus conceived is susceptible of numerous modifications
25 and variations, all of which are within the scope of the appended claims; all the details may further be replaced with other technically equivalent elements.

In practice, the materials used, as well as the dimensions, may be any according to requirements and to the state of the art.

30 The disclosures in Italian Patent Application No. MI2008A000122

from which this application claims priority are incorporated herein by reference.

Where technical features mentioned in any claim are followed by reference signs, those reference signs have been included for the sole
5 purpose of increasing the intelligibility of the claims and accordingly, such reference signs do not have any limiting effect on the interpretation of each element identified by way of example by such reference signs.

CLAIMS

1. A needle for transferring stitches therefrom to adjacent needles for knitting machines for hosiery or the like, comprising a shank (2), a head (3) that is arranged at a longitudinal or upper end of said shank (2) and is
5 contoured like a hook that is open toward the front side of said shank (2), and a latch (4), which is pivoted to said shank (2) proximate to said head (3), about a pivoting axis (4a) that is substantially perpendicular to the longitudinal axis of said shank (2), and rotatable about said pivoting axis (4a) in order to open or close said head (3), characterized in that it
10 comprises at least one lamina (6a, 6b) that is connected to said shank (2) and has, on each of the two opposite sides (7a,7b) of said shank (2), below said latch (4), a portion (8a,8b) that can flex elastically from an inactive position, in which it is closer to the corresponding side (7a,7b) of the shank (2), to an active position, in which it is spaced from the corresponding side
15 (7a,7b) of the shank (2); in said active position, said elastically flexible portion (8a,8b) of the lamina (6a,6b) producing an expansion of the loop of knitting (9) that is fitted onto said shank (2) at said elastically flexible portion (8a,8b) of the lamina (6a,6b), the head (3) of an adjacent needle (1b) being insertable in the space comprised between said elastically flexible
20 portion (8a,8b) of the lamina (6a,6b), in said active position, and the corresponding side (7a,7b) of said shank (2), in order to pick up said loop of knitting (9) by means of said adjacent needle (1b); said shank (2) having, between said latch (4) and the end of said elastically flexible portion (8a,8b) of the lamina (6a,6b) that is directed toward said head (3), a region (10) for
25 blending said shank (2) with said elastically flexible portion (8a,8b) of the lamina (6a,6b).

2. The needle according to claim 1, characterized in that said blending region (10) is shaped like a wedge that tapers toward said head (3) of the needle (1).

30 3. The needle according to claim 1, characterized in that said lamina

(6a,6b) has, for each side of said shank (2): a lower region (20a), which lies so as to adhere to the corresponding side (7a,7b) of said shank (2) and is fixed thereto; an intermediate region, which constitutes said elastically flexible portion (8a,8b) of the lamina (6a,6b); and an upper region (11a,11b), which ends with the upper end (12a,12b) of the lamina that rests against the corresponding side (7a,7b) of said shank (2).

4. The needle according to one or more of the preceding claims, characterized in that said lower region (20a,20b) of the lamina (6a,6b) is fixed to the corresponding side (7a,7b) of said shank (2) at a corresponding recess and said elastically flexible portion (8a,8b) of the lamina (6a,6b) is shifted forwardly with respect to said lower region (20a,20b) of the lamina (6a,6b).

5. The needle according to one or more of the preceding claims, characterized in that the region of the needle (1) at which the elastically flexible portions (8a,8b) of said lamina (6a,6b) are arranged has, along the anteroposterior direction of the needle (1), a space occupation that increases toward the front side of the needle (1) with respect to the contiguous regions, said blending region (10) having a front face (10c) that is inclined with respect to the longitudinal axis of said shank (2) in order to blend at the front the region of said shank (2) that is provided with said elastically flexible portions (8a,8b) of the lamina (6a,6b) with the overlying contiguous region.

6. The needle according to one or more of the preceding claims, characterized in that said blending region (10) is delimited laterally by sides (10a,10b) that are shaped, at least for a segment starting from their upper end, like a plane that is inclined with respect to the longitudinal axis of said shank (2) and progressively approach each other in the direction of said head (3).

7. The needle according to one or more of the preceding claims, characterized in that the lower end of said blending region (10) is wider than

the distance between the two opposite sides (7a,7b) of the shank (2) in regions that are contiguous to said blending region (10).

8. The needle according to one or more of the preceding claims, characterized in that the upper end (12a,12b), directed toward said head (3),
5 of said elastically flexible portions (8a,8b) of the lamina (6a,6b) is connected to said blending region (10) proximate to its base.

9. The needle according to one or more of the preceding claims, characterized in that the upper end (12a,12b), directed toward said head (3), of each one of said elastically flexible portions (8a,8b) of the lamina (6a,6b)
10 rests, so that it can slide along a direction that is parallel to the longitudinal axis of said shank (2), in a recess (19a,19b) formed in the corresponding side (10a,10b) of said blending region (10).

10. The needle according to one or more of the preceding claims, characterized in that the front face (10c) of said blending region (10) has a
15 curved blending portion proximate to the base of said blending region (10).

11. The needle according to one or more of the preceding claims, characterized in that said blending region (10) is provided at least partially monolithically with said shank (2).

12. The needle according to one or more of the preceding claims,
20 characterized in that said blending region (10) is formed at least partially by a block that is fixed to said shank (2).

13. The needle according to one or more of the preceding claims, characterized in that each one of said elastically flexible portions (8a,8b) of the lamina (6a,6b) is constituted, starting from its lower end and in the
25 absence of forces acting thereon: by a first segment (13a,13b), which is folded away from the corresponding side (7a,7b) of said shank (2); by a second segment (14a,14b), which is substantially parallel to the corresponding side (7a,7b) of said shank (2); and by a third segment (15a,15b), which is folded toward the corresponding side (7a,7b) of said
30 shank (2); said first segment (13a,13b) being able to engage slidably a side

(10a,10b) of the blending region (10) of an adjacent needle (1b) for the transition of said elastically flexible portion (8a,8b) of the lamina (6a,6b) from said active position to said inactive position as a consequence of the longitudinal movement of the needle (1) with respect to the adjacent needle
5 (1b).

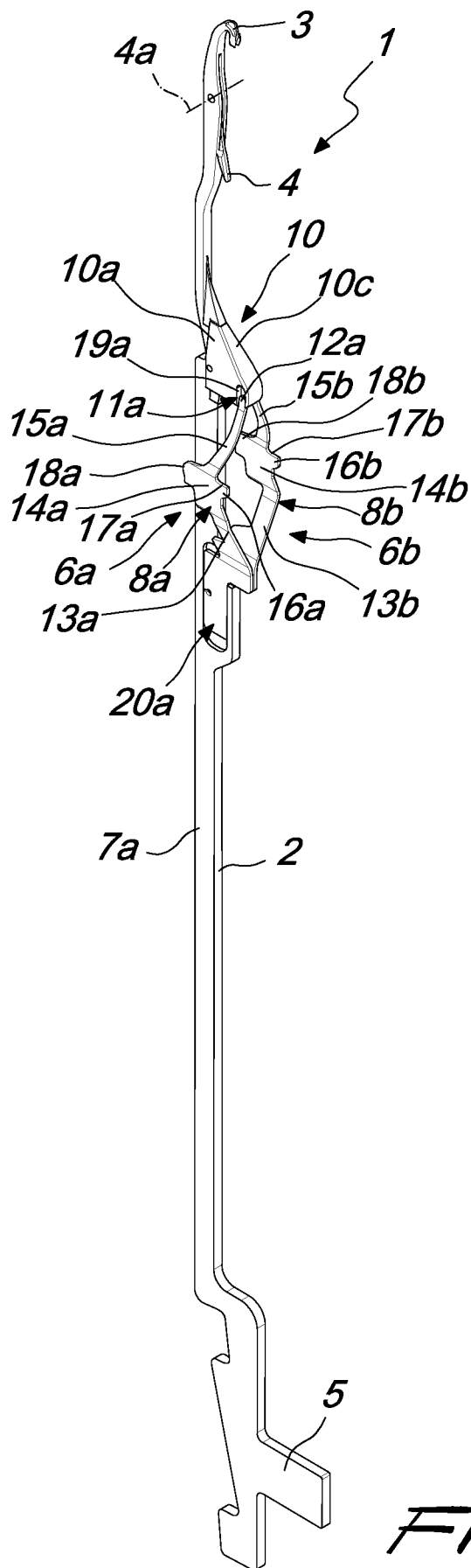


Fig. 1

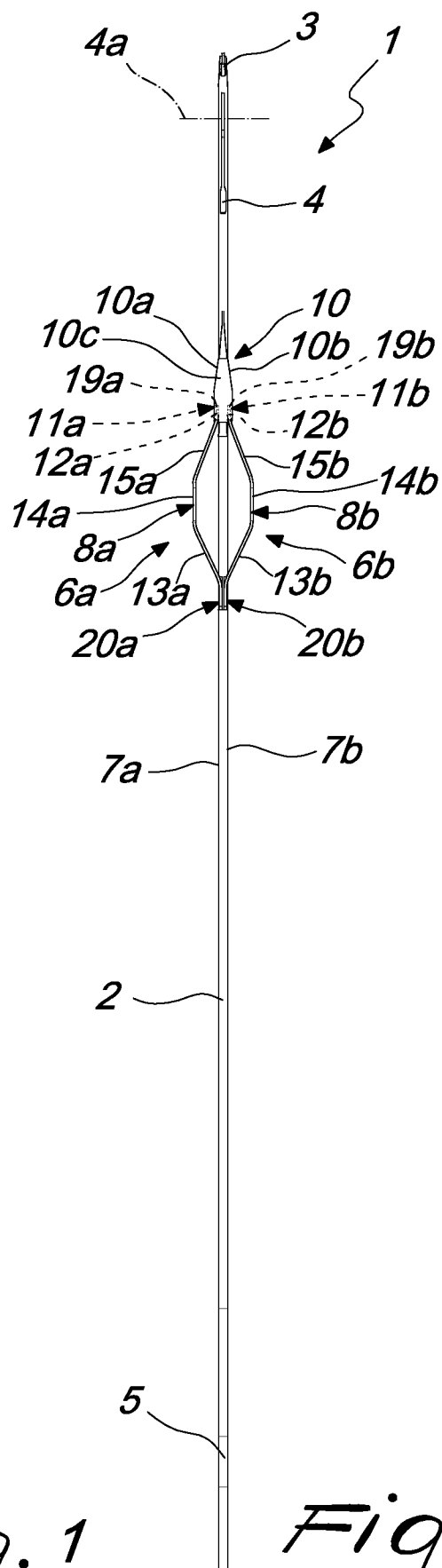


Fig. 2

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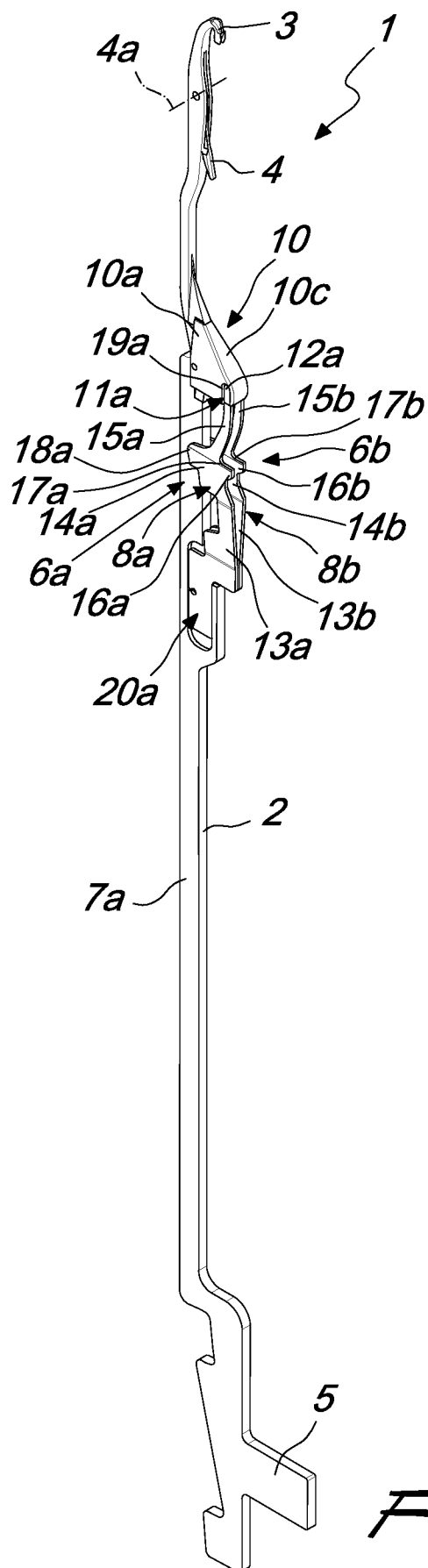


Fig. 3

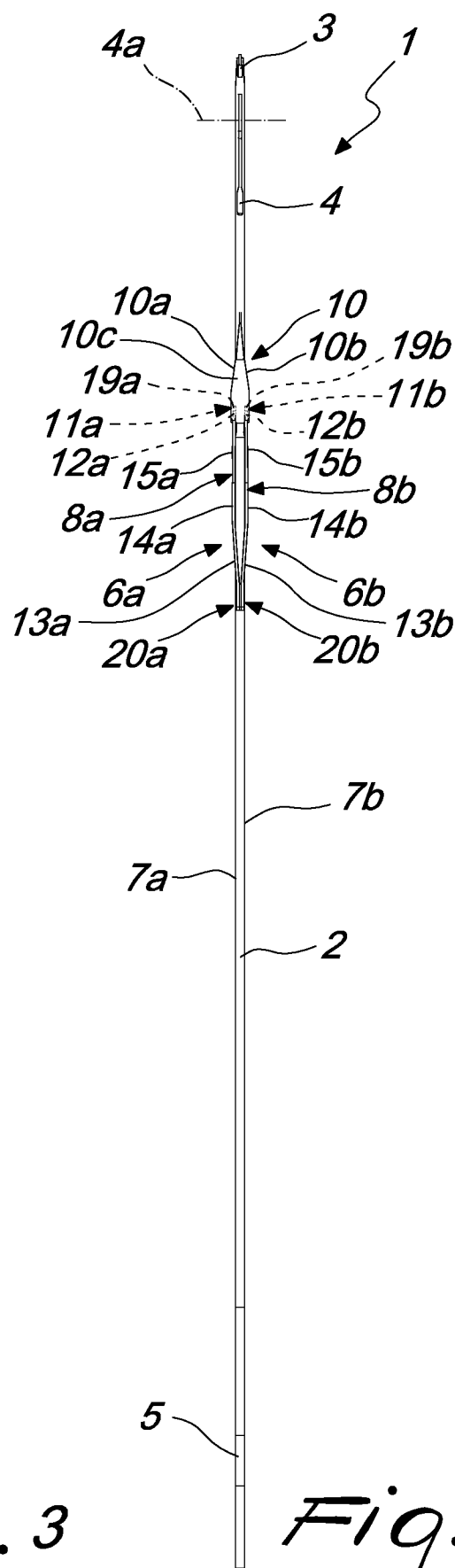
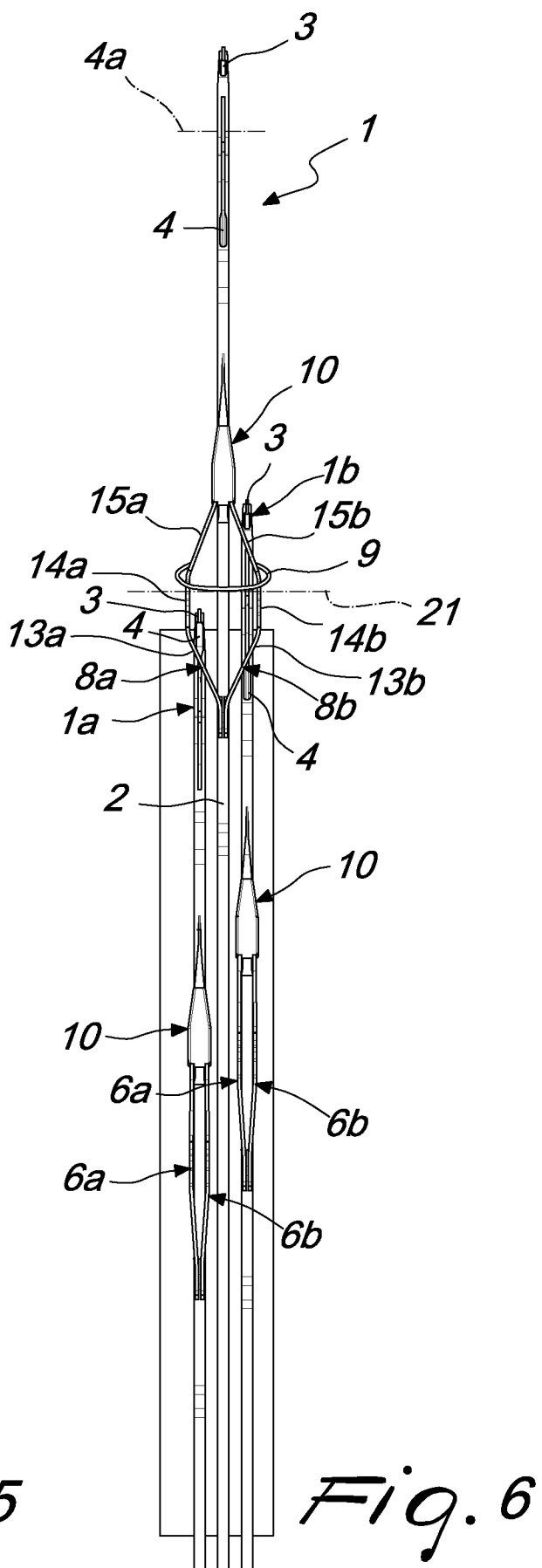
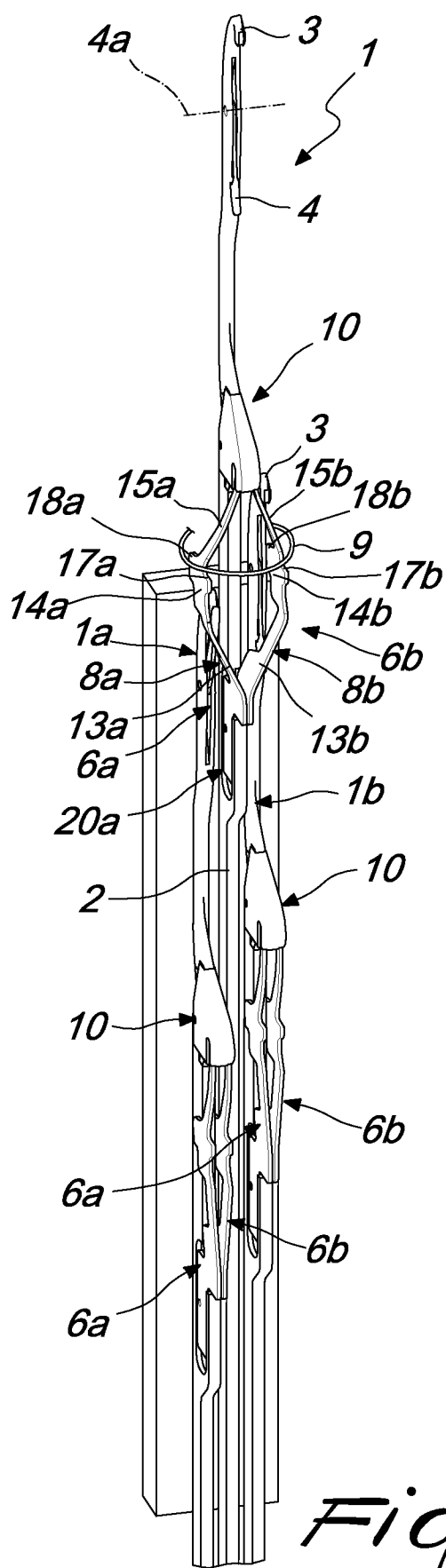
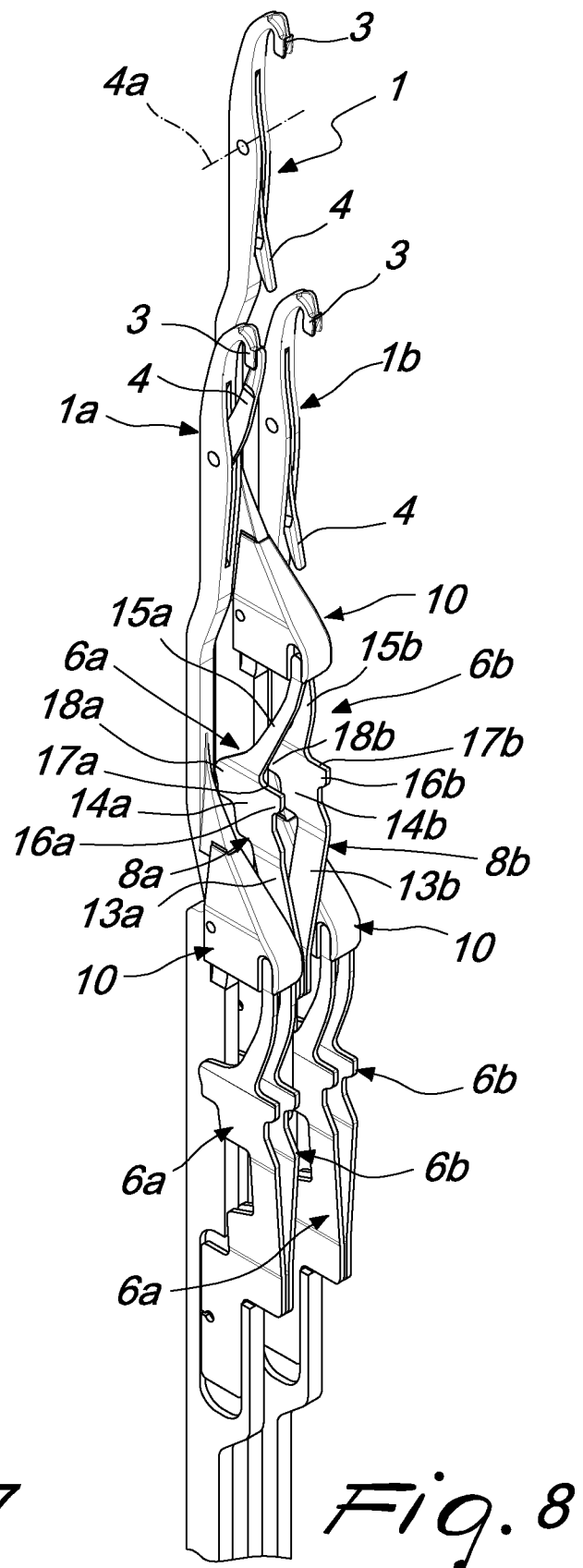
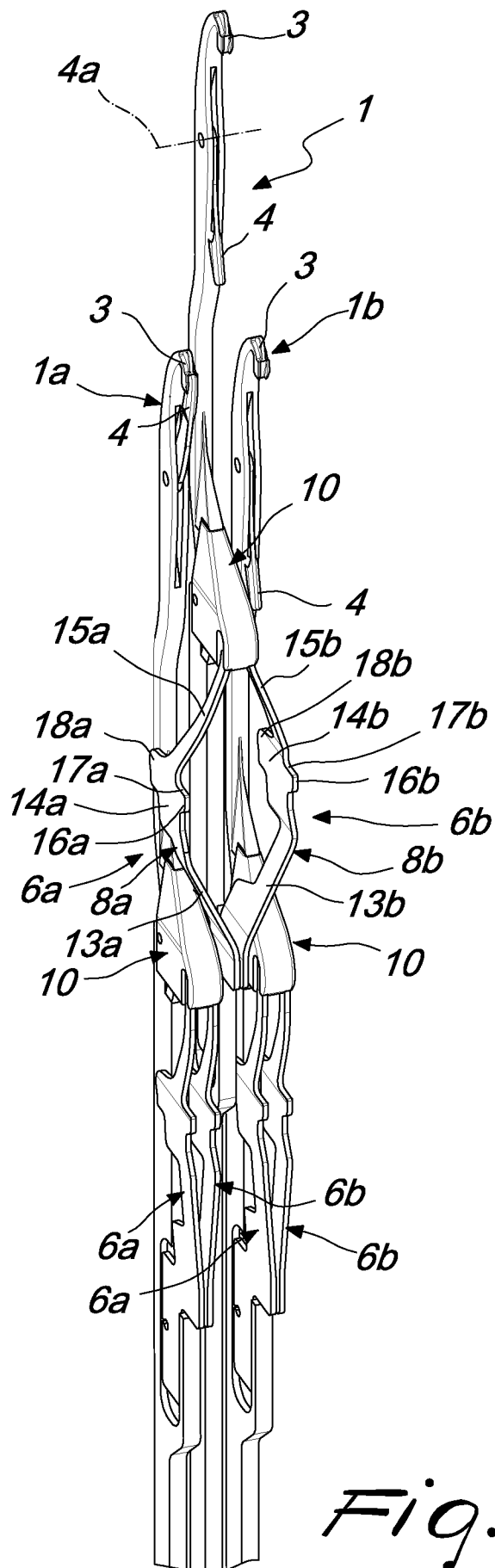


Fig. 4





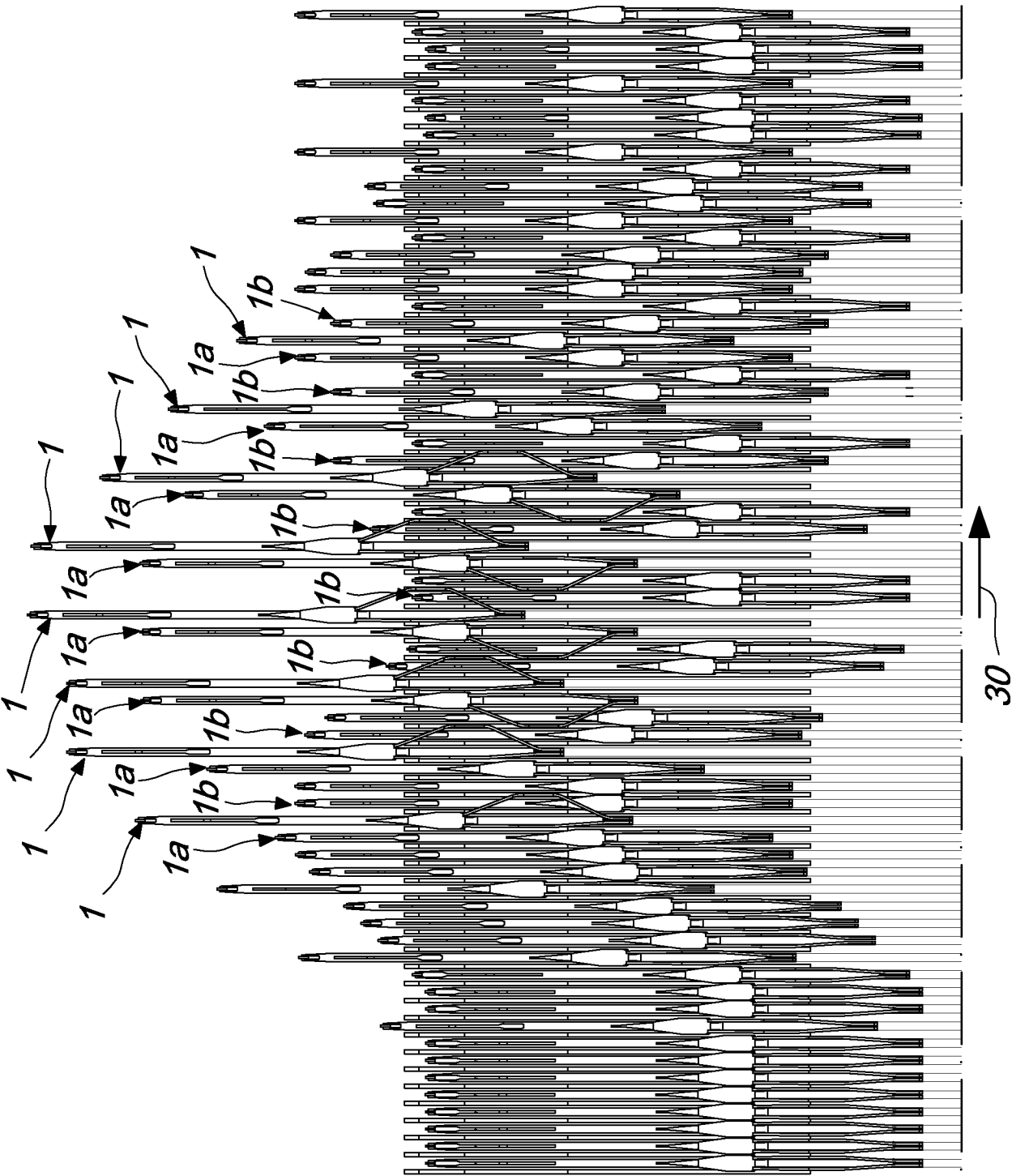


Fig. 9

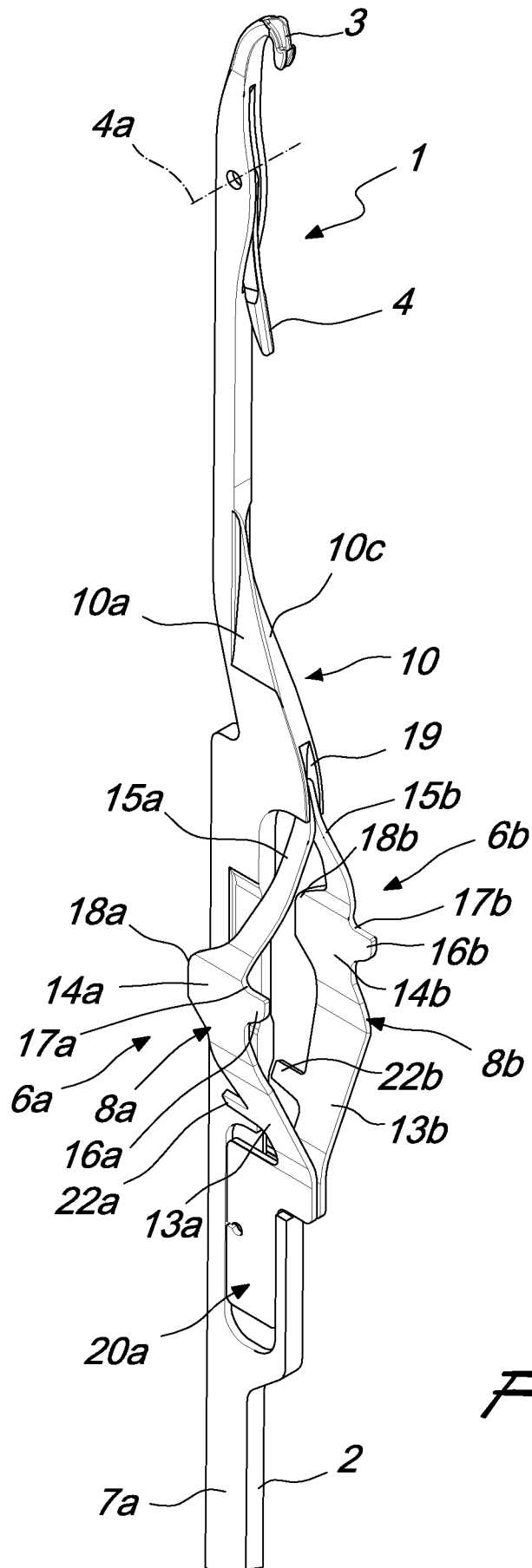


Fig. 10

INTERNATIONAL SEARCH REPORT

International application No

PCT/EP2009/050805

A. CLASSIFICATION OF SUBJECT MATTER
INV. D04B35/04

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
D04B

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

EP0-Internal

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	WO 2007/057041 A1 (SANTONI & C SPA [IT]; LONATI ETTORE [IT]; LONATI FAUSTO [IT]; LONATI T) 24 May 2007 (2007-05-24) cited in the application page 8, paragraph 1 - page 10, paragraph 2; figure	1, 3-4, 8-11, 13
A	US 2 397 456 A (JULIUS SIRMAY) 26 March 1946 (1946-03-26) page 2, left-hand column, line 16 - left-hand column, line 57	1

☐ Further documents are listed in the continuation of Box C.

☒ See patent family annex.

* Special categories of cited documents:

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Y document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

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Date of the actual completion of the international search

27 March 2009

Date of mailing of the international search report

07/04/2009

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INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

PCT/EP2009/050805

Patent document cited in search report		Publication date		Patent family member(s)	Publication date
WO 2007057041	A1	24-05-2007	CN	101213332 A	02-07-2008
			EP	1948859 A1	30-07-2008
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			GB	495379 A	08-11-1938