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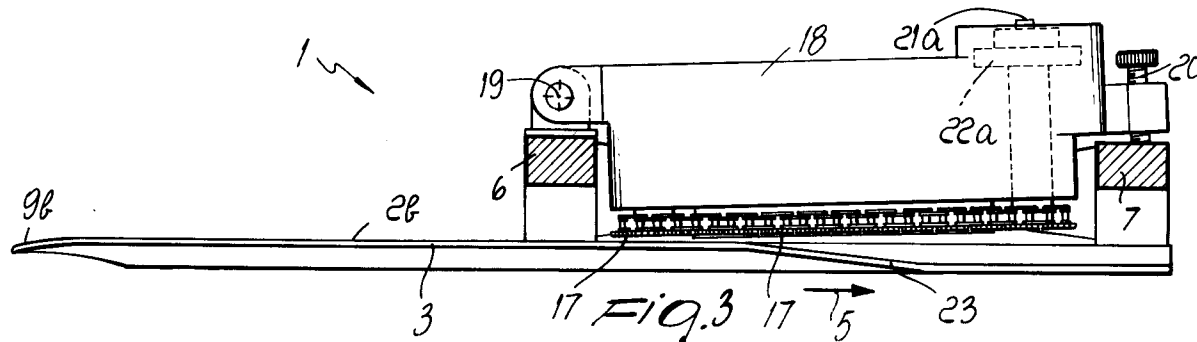
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**16**  
**I-20123 Milano (IT)**(54) **Positioning device in sewing machines for closing the toe of socks or the like.**

(57) The present invention relates to a positioning device in sewing machines for closing the toe of socks or the like. The device comprises a pair of laminae (2a,2b) which are arranged mutually adjacent so as to define, between them, a passage (3) in which a portion (11) of the sock, which is arranged proximate to the toe of the sock and is thinner at least with respect to a border (10) which delimits this portion on the sock body side, is inserted. The sock is arranged between the laminae so that one free

end (12) of the toe to be closed protrudes from one side of the pair of laminae and so that the body (4a) of the sock protrudes from the opposite side. The device comprises tension application means (14a,14b) which can engage the free end of the toe and cooperate with the laminae in order to position the border, which delimits the thinner portion on the sock body side, against the side (23) of the laminae which is directed toward the sock body during the advancement of the sock along the passage.

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The present invention relates to a positioning device in sewing machines for closing the toe of socks or the like.

As is known, socks, men's socks in particular, are generally manufactured with circular machines which form a semiworked tubular product which is shaped like a sock and is open at the toe. This product is then subjected to a finishing operation which consists in closing the toe by darning or by so-called "blind" mechanical sewing.

In the darning operation, the loops at the open toe of the sock are arranged manually, one by one, on appropriate pins of the darning machine which are then affected by an extremely accurate sewing which joins the various loops to one another. Sewing performed with darning machines can be likened to the creation of a row of knitting whose loops join the loops of the toe of the sock. The finish obtained with the darning operation is very good, since the loop joining line is scarcely detectable not only visually but also to the touch.

Although it provides a very good final result, darning has the problem that it requires relatively long execution times and thus significantly affects the costs of the finished product. Due to this reason, darned socks are the best-finished and most sought-after socks, but are also the most expensive.

Finishing by blind sewing is considerably faster in execution, since the flaps of the open toe of the sock are merely arranged manually mutually adjacent and are fed to a sewing machine which joins them by means of one or more sewings. Naturally, blind sewing is not as precise as darning, and the degree of finish is significantly lower.

However, finishing by blind sewing has the advantage, with respect to darning, that it requires significantly shorter execution times and thus allows to manufacture finished socks with considerably lower costs.

Through the years, sewing machines for finishing socks have been the subject of various improvements aimed at providing better finish quality. These improvements have generally affected the sewing devices and the methods for performing the sewing, whereas the positioning of the sock on the machine has always been entrusted to the skill and experience of the operator.

More particularly, sewing machines for finishing socks currently in use are provided, at their inlet, with a pair of laminae which are arranged mutually adjacent so as to define, between them, a passage in which the sock is inserted proximate to the toe, with its two flaps to be joined arranged mutually adjacent beforehand. The sock is then pulled, in this arrangement, along the passage defined by the two laminae toward a cutting unit which removes the excess part of the flaps of the toe to be closed

and toward one or more sewing units which close the toe.

The positioning of the sock between the two laminae, which act as guides during the advancement of the sock, is facilitated by a particular execution of the part of sock to be sewn. This particular execution, which is performed on the circular machine, substantially consists in ending the toe, which is to be subsequently closed, with a few rows of knitting constituted by a highly elastic thread, for example made of polyamide fiber, which is thinner than the remaining part of the sock and, subsequently, of a thicker border which is intended to be removed, together with the rows made of elastic thread, prior to sewing.

The sock is inserted between the pair of laminae so that the flaps to be joined are arranged mutually adjacent and so that the thinner elastic portion is arranged at the passage defined between the laminae, so that said border protrudes from one side of the laminae whereas the remaining part of the sock protrudes from the opposite side.

It is evident that the arrangement of the sock between the laminae is extremely important for the outcome of the sewing, and this is why the operator uses maximum care in inserting the sock between the laminae, trying to place the border which delimits the thinner portion on the sock body side as close as possible against the corresponding side of the laminae.

Nonetheless, unwanted movements of the sock, which can be ascribed mainly to friction between the sock and the laminae, often occur during the advancement of the sock along the laminae, thereby altering the correct positioning performed and leading to a scarcely precise sewing.

Italian patent application no. 20259 A/90 filed on May 10, 1990 in the name of the same Applicant proposes a particular preparation of the sock proximate to the toe to be closed, which can be performed with conventional sock-making machines. Said patent, among other things, suggests to produce, prior to the thinner elastic portion, a row of knitting with longer loops with the addition of a reinforcement thread.

This refinement allows to obtain a semiworked product which has, proximate to the toe to be closed, starting from the body of the sock, a row of thicker knitting with longer loops, a thinner portion made of elastic thread, and finally a border which is thicker than said portion. With a product of this type, arranged correctly during the execution of blind sewing, it is possible to obtain socks whose degree of finish can be compared to that which can be obtained with darned socks, despite distinctly lower production costs.

However, the sewing machines currently in use are unable to fully exploit this possibility due to the above described difficulty in achieving a correct placement of the sock.

The aim of the present invention is to provide a device for sewing machines for closing the toe of socks or the like, which can ensure the correct positioning of the sock while it is fed to the cutting and sewing unit so as to allow to obtain socks with a sewn toe with a considerably improved degree of finish.

Within the scope of this aim, an object of the invention is to provide a positioning device which can be fitted to current sewing machines and allows to fully exploit the advantages, in terms of quality and costs, offered by the particular preparation of the products for manufacturing socks which are the subject of the above mentioned patent application no. 20259 A/90.

Another object of the invention is to simplify and quicken the operations for positioning the products with the toe to be sewn on the sewing machines.

A further object of the invention is to provide a device which can be manufactured in a simple manner and with modest production costs.

This aim, these objects and others which will become apparent hereinafter are achieved by a positioning device in sewing machines for closing the toe of socks or the like, comprising a pair of laminae which are arranged mutually adjacent so as to define, between them, a passage for the insertion of a portion of the sock, arranged proximate to the toe to be closed, which has a reduced thickness at least with respect to a border which delimits said portion on the side of the body of the sock, in order to position said sock so that one free end of the toe to be closed protrudes from one side of said pair of laminae and so that the body of the sock protrudes from the opposite side, characterized in that it comprises tension application means which can engage said free end of the toe and cooperate with said laminae in order to position said border, which delimits said reduced-thickness portion on the side of the body of the sock, against the side of said laminae which is directed toward said sock body during the advancement of the sock along said passage.

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

figure 1 is an exploded perspective view of the device according to the invention;

figure 2 is a top plan view of the device;

figure 3 is a sectional view of figure 2, taken along the axis III-III;

figure 4 is a bottom plan view of a detail of the device;

figures 5 and 6 are sectional views of the device, taken similarly to figure 3, illustrating the operation of the device according to the invention.

With reference to the above figures, the positioning device according to the invention, generally designated by the reference numeral 1, comprises, in a known manner, a pair of laminae 2a and 2b which are arranged mutually adjacent so as to define, between them, a passage 3 inside which a sock 4, whose toe is to be closed, is intended to be inserted; said toe is to be closed by means of a sewing which is performed by sewing units arranged downstream of the positioning device 1, along the advancement direction indicated by the arrow 5, which is parallel to the longitudinal extension of the laminae 2a and 2b and thus of the passage 3.

More particularly, the laminae 2a and 2b are associated in a downward direction with two supports 6 and 7 which are mutually spaced along the advancement direction 5 and are joined by a cross-member 8. The laminae 2a and 2b are co-planar and are generally associated, by means of the supports 6 and 7, with the sewing machine so that they are arranged in a horizontal plane.

The ends 9a and 9b of the laminae, between which the sock 4 must be inserted, are conveniently rounded in order to facilitate insertion.

According to the invention, the device is provided with tension application means 13 which can engage the free end of the toe of the sock 4 and cooperate with the laminae 2a and 2b in order to position it correctly with respect to the laminae.

More particularly, the sock 4, whose toe must be closed by sewing, is preferably constituted by a product manufactured according to what is described in patent application no. 20259 A/90. Such a product has, proximate to the toe to be closed, a row of knitting 10, possibly reinforced, which is constituted by longer loops with respect to the body 4a of the sock formed previously; a portion 11, which is constituted by a few rows of knitting made with a thin elastic thread and is therefore thinner than the row 10 and the body of the sock; and an end border 12 which is thicker than the portion 11.

The sock 4 is inserted between the laminae 2a, 2b so that the two flaps of the toe to be sewn are mutually adjacent and so that the thinner portion 11 is arranged at the passage 3, so that the end border 12, which constitutes the free end of the toe, protrudes from the upper side of the laminae 2a and 2b, whereas the body of the sock protrudes

from the lower side of the laminae 2a and 2b.

The tension application means can engage the border 12 and apply traction to the sock in a direction which is transverse to the plane of arrangement of the laminae 2a and 2b so as to arrange, during the advancement of the sock along the direction 5, the row of knitting 10, which delimits the thinner portion 11, against the lower side of the laminae 2a, 2b.

Conveniently, the tension application means 13 comprise a device which is fitted with clamps which can move along the advancement direction 5 and can engage the border 12. The clamp-fitted device faces the upper side of the laminae 2a and 2b, and the advancement direction of the clamps is concordant with the direction 5 but is inclined with respect to the plane of arrangement of the laminae in order to progressively space the clamps, which engage the border 12, from the plane of arrangement of the laminae.

More particularly, in the illustrated embodiment, the clamp-fitted device comprises a pair of chains 14a and 14b which wind around two pairs of pinions, respectively 15a, 15b, 16a and 16b, and are arranged in a plane which faces the upper face of the laminae 2a and 2b.

Two arms of the chains 14a and 14b face one another at the passage 3, and the links of said chains are provided with teeth 17 which mesh together at the arms of the chains which face one another so as to engage the border 12.

The chains 14a and 14b and the pinions on which they wind are supported by a block 18 which is pivoted, with one of its ends, to the support 6 about a pivoting axis 19 which is arranged transversely to the advancement direction 5 so as to allow the block 18 to oscillate about said axis in order to vary the inclination of said block 18, and thus of the plane of arrangement of the chains 14a and 14b, with respect to the plane of arrangement of the laminae 2a and 2b. The inclination of the block 18 is adjusted by means of a screw 20 which is associated with the end of the block which is opposite to its pivoting axis and rests against an abutment which is rigidly associated with the laminae and is constituted by the support 7.

The pinions 15a and 15b are supported by shafts 21a and 21b which are mutually connected by means of a pair of gears 22a and 22b so that the pinions 15a and 16a rotate in opposite directions with respect to the pinions 15b and 16b, thus obtaining the concordant advancement of the chains 14a and 14b along the mutually facing arms. One of the two shafts 21a or 21b is rotated about its own axis in a per se known manner, for example by means of an electric motor which is not illustrated for the sake of simplicity.

Advantageously, the laminae 2a and 2b have a thinner region proximate to the passage 3, and their portion which delimits the passage 3, in the region of the chains 14a and 14b, is provided with a portion 23 which extends away from the plane of arrangement of the chains 14a and 14b, along the advancement direction 5, in order to aid the chains in applying tension to the sock, as will become apparent hereinafter.

Conveniently, means are provided for adjusting the mutual distance of the laminae 2a, 2b so as to allow to vary the width of the passage 3. Said adjustment means can be constituted, in a known manner, by screws 24 and 25 which can turn by means of knobs 26 and 27 associated with the supports 6 and 7 and couple to female threads which are rigidly associated with one of the laminae in order to move it transversely to the direction 5. The screws 24 and 25 can be locked by means of transverse screws 28 and 29 which are also associated with the supports 6 and 7.

The operation of the positioning device according to the invention is as follows.

The sock 4 to be sewn is inserted between the ends 9a and 9b of the laminae, so that the thinner portion 11 is at the passage 3, and is pulled manually along the direction 5 up to the chains 14a and 14b. The chains 14a and 14b, by virtue of the teeth 17, engage the border 12 of the sock and automatically continue the advancement of said sock along the advancement direction 5.

Due to the inclination of the plane of arrangement of the chains 14a and 14b with respect to the plane of arrangement of the laminae 2a and 2b, the sock is subjected, during advancement, to an application of tension, transversely to the plane of arrangement of the laminae, which moves the row 10, i.e. the border which delimits the thinner portion 11 on the side of the sock body 4a, against the lower side of the laminae 2a, 2b. It should be noted that this application of tension is aided by the presence of the portion 23 of the laminae which is inclined in the opposite direction.

Any excess tension applied to the sock is absorbed by the elastic deformability of the thinner portion 11 which, as mentioned, is made of a highly elastic thread. It should be noted that the sock is positioned correctly, by virtue of this tension applied thereto, even if the operator has not inserted the sock in the passage 3 with great care.

In this manner, the sock reaches the cutting and sewing stations, arranged downstream of the device, in a correct position, and the cutting of the portion 11 and of the border 12, as well as the sewing, can occur with great precision.

In the particular case in which the products subjected to sewing are of the type described in patent application no. 20259 A/90, the finished

socks have a degree of finish which is aesthetically and qualitatively comparable to that of darned socks.

The mutual distance of the laminae 2a and 2b and the inclination of the plane of arrangement of the chains 14a and 14b with respect to the laminae are changed according to the type of sock to be sewn.

In practice it has been observed that the device according to the invention fully achieves the intended aim, since by ensuring the precise positioning of the socks in the sewing machine it allows to perform extremely accurate sewings, obtaining high quality for the finished socks.

A further advantage is that it simplifies and quickens the operation for loading the socks on the sewing machines.

Although the positioning device according to the invention has been studied in particular for sewing socks prepared according to the teachings of patent application no. 20259 A/90, it can in any case be used to position socks prepared for sewing the toe in a conventional manner. In this case, although the sewing does not achieve aesthetic and qualitative characteristics comparable to those of darning, the result is in any case a sewing which is more precise, and thus qualitatively better, than sewings performed with conventional sewing machines, i.e. with sewing machines not provided with the positioning device according to the invention.

The device thus conceived is susceptible to numerous modifications and variations, all of which are within the scope of the inventive concept; all the details may furthermore be replaced with technically equivalent elements.

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

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

## Claims

1. Positioning device in sewing machines for closing the toe of socks or the like, comprising a pair of laminae (2a,2b) which are arranged mutually adjacent so as to define, between them, a passage (3) for the insertion of a portion (11) of a sock (4), arranged proximate to the toe to be closed, which is thinner at least than a border (10) which delimits said portion on the sock body (4a) side, in order to

position said sock so that one free end (12) of the toe to be closed protrudes from one side of said pair of laminae and so that the body (4a) of the sock protrudes from the opposite side, characterized in that it comprises tension application means (14a,14b) which can engage said free end of the toe and cooperate with said laminae (2a,2b) in order to position said border (10), which delimits said thinner portion (11) on the sock body (4a) side, against the side (23) of said laminae which is directed toward said sock body (4a) during the advancement of the sock along said passage (3).

2. Device according to claim 1, characterized in that said laminae (2a,2b) are co-planar at least proximate to said passage (3), said tension application means comprising a device fitted with clamps (14a,14b) which can move along an advancement direction which follows the extension of the passage (3) defined by said laminae (2a,2b), said clamp-fitted device facing the side of said laminae which supports said free end (12) of the toe of the sock, said advancement direction being inclined with respect to the plane of arrangement of said laminae in order to progressively space said clamps (14a,14b), which engage said free end of the toe of the sock, from the plane of arrangement of said laminae during advancement along said passage.

3. Device according to claims 1 and 2, characterized in that said clamp-fitted device comprises a pair of chains (14a,14b) two arms of which face one another at said passage (3), each of said chains having links provided with teeth (17) which engage the teeth of the links of the other chain along the two mutually facing arms in order to engage the free end (11) of the toe of the sock inserted in said passage (3).

4. Device according to one or more of the preceding claims, characterized in that said chains (14a,14b) wind around two pairs of counter-rotating pinions (15a,15b,16a,16b) which are arranged in a plane which faces said laminae (2a,2b) and is inclined with respect to the plane of arrangement of said laminae.

5. Device according to one or more of the preceding claims, characterized in that it comprises means (19,20) for adjusting the inclination of said advancement direction of the clamp-fitted device with respect to the plane of arrangement of said laminae.

6. Device according to one or more of the preceding claims, characterized in that it comprises a block (18) which supports said pinions (15a,15b,16a,16b) and is pivoted to said laminae about an axis (19) which is arranged transversely to said advancement direction (5) in order to allow oscillation for the adjustment of the inclination of said block (18) with respect to the plane of arrangement of said laminae (2a,2b), the inclination of said block being variable by means of a screw (20) which is associated with said block in a position which is spaced from its pivoting axis (19) and rests on an abutment (7) which is rigidly associated with said laminae (2a,2b).
7. Device according to one or more of the preceding claims, characterized in that at least one portion (23) of said laminae which delimits said passage (3), at said tension application means, extends for a certain portion away from said tension application means along said advancement direction (5).
8. Device according to one or more of the preceding claims, characterized in that it comprises means (24-29) for adjusting the mutual distance of said laminae in order to vary the width of said passage.

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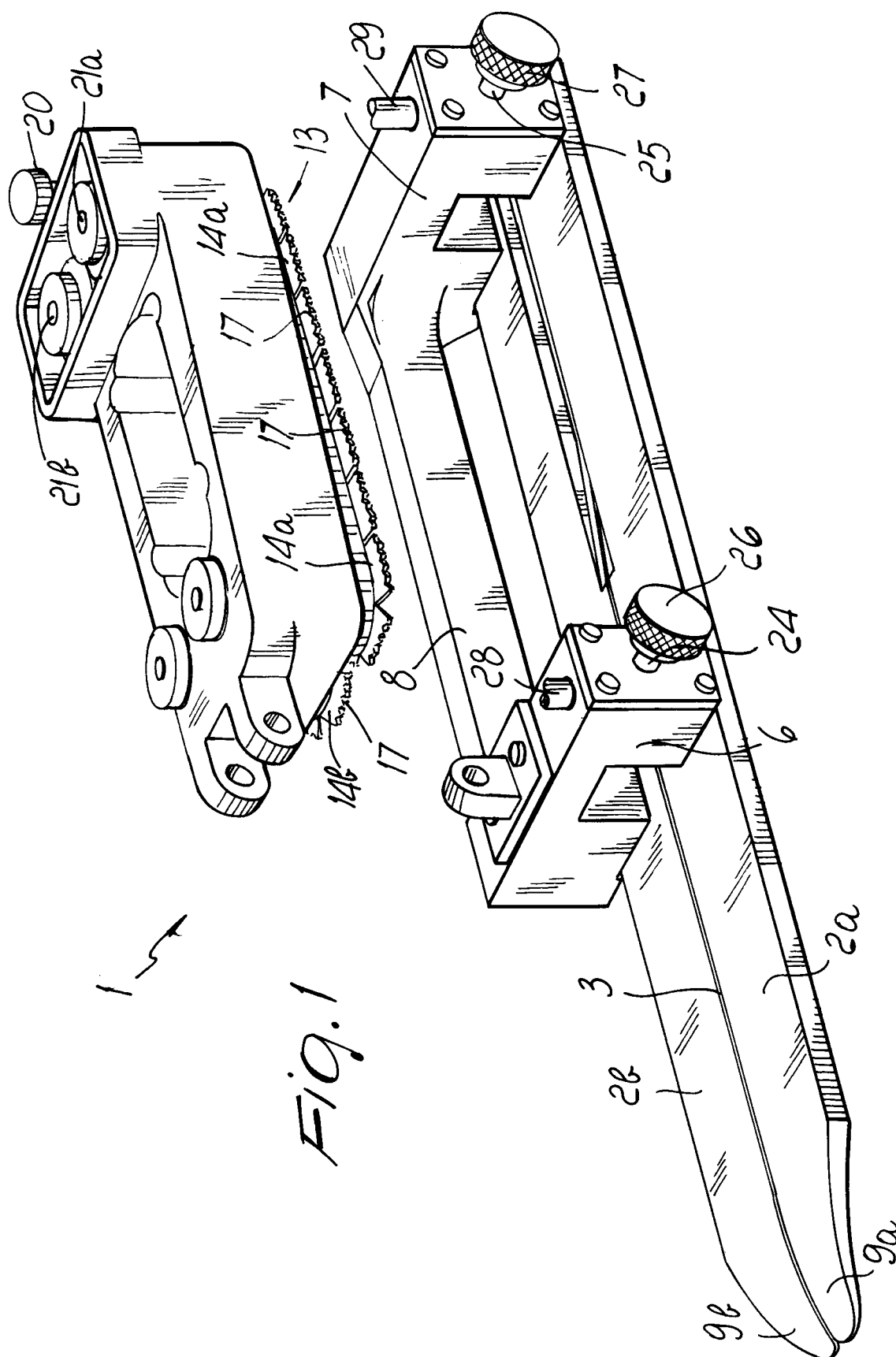
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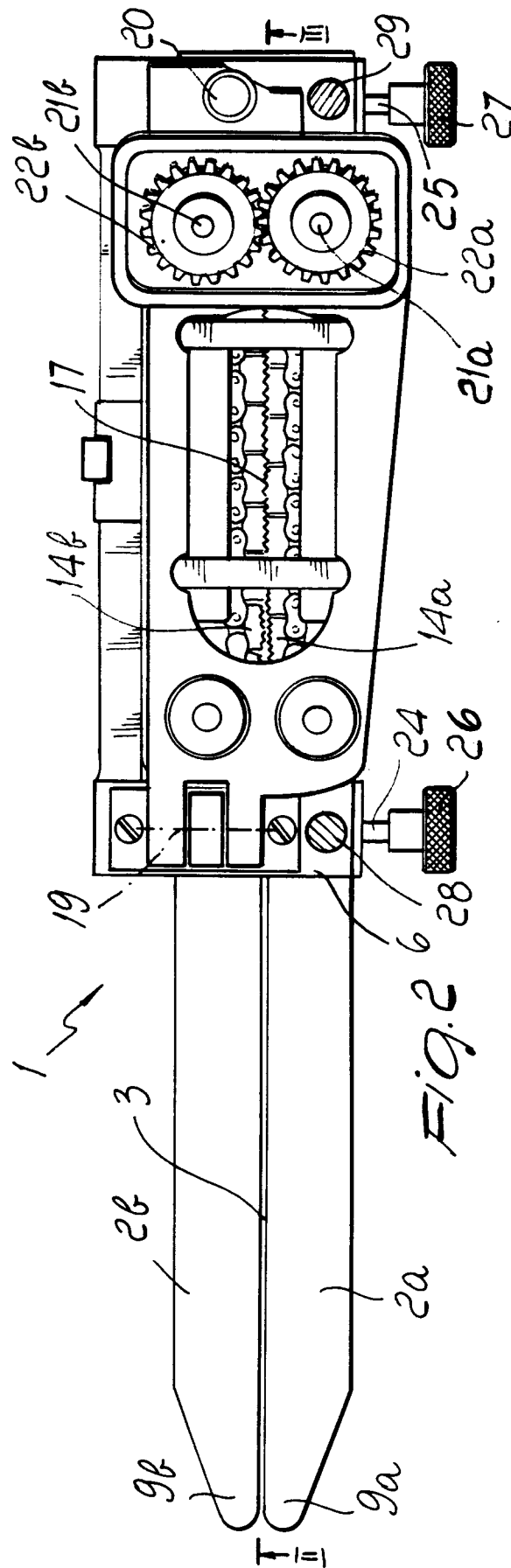
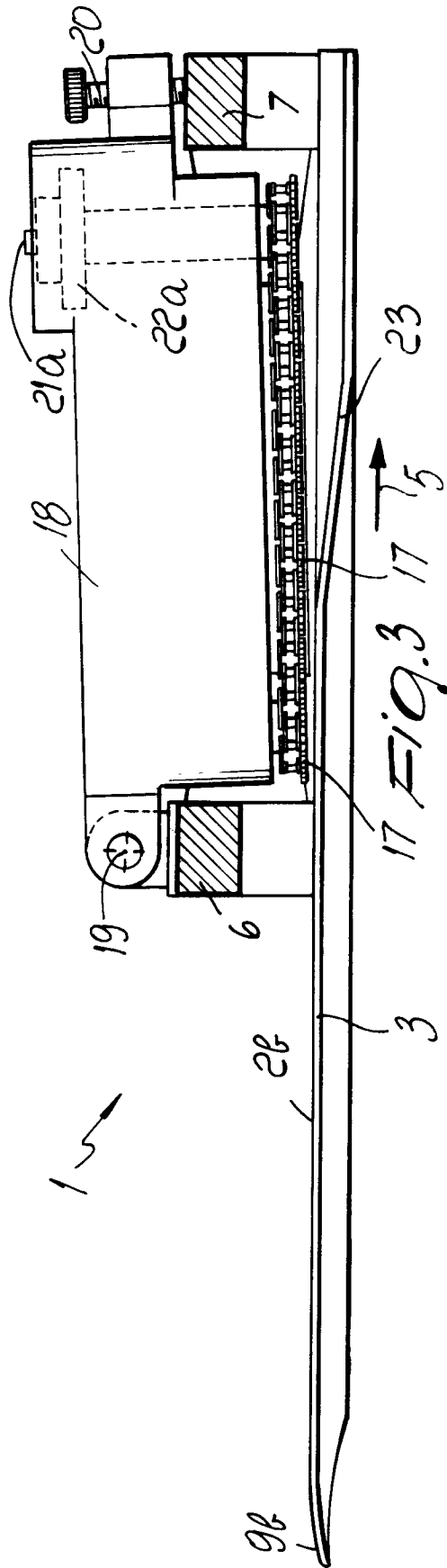
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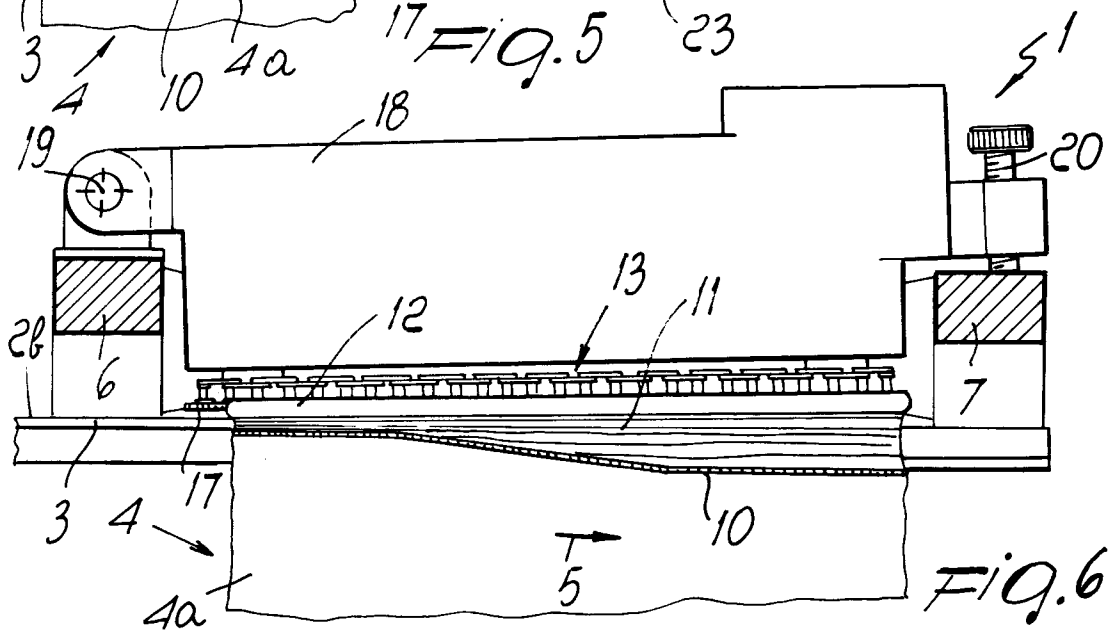
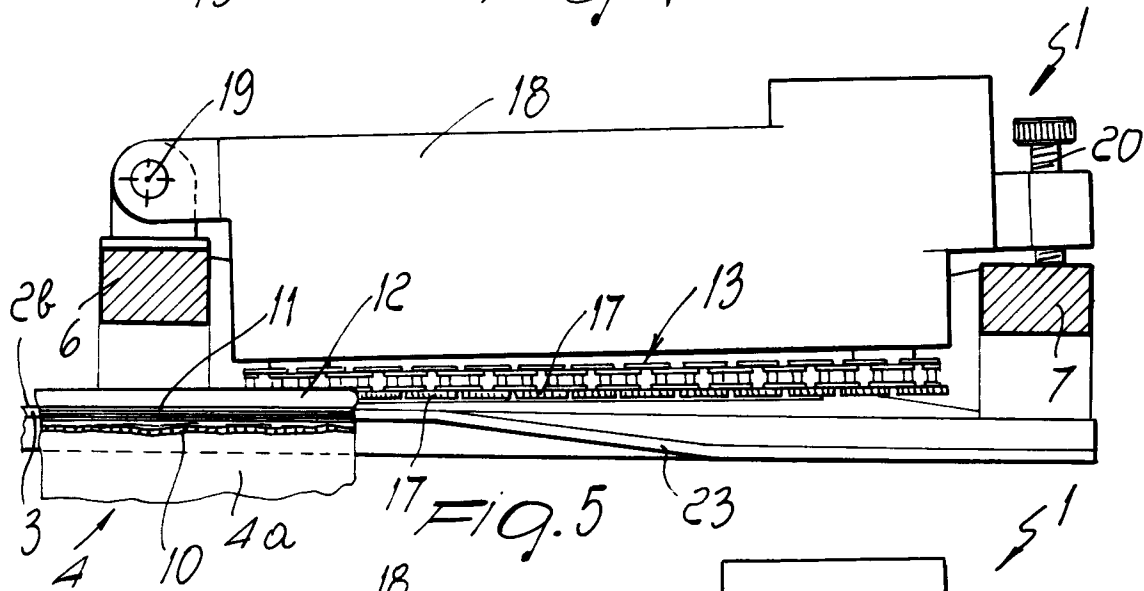
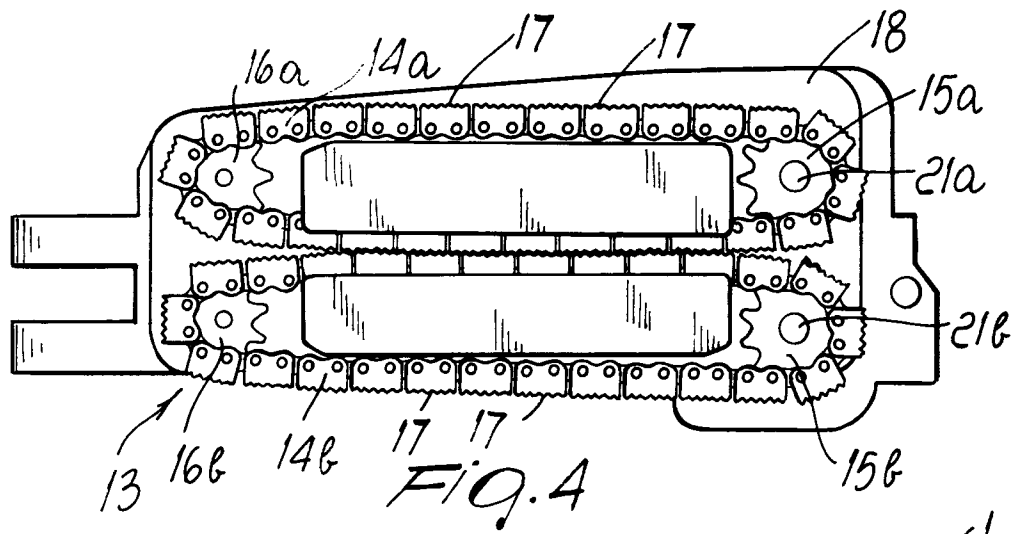
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## EUROPEAN SEARCH REPORT

Application Number

EP 92 10 2411

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.5)
X	DE-A-2 420 167 (H.C. ANDERSEN)	1,2	D05B23/00
Y	* page 5, line 6 - line 22 *	3,4,6	D05B7/00
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Y	EP-A-0 011 459 (T. SAKONISHI; T. NAKAHIRA)	3,4,6	
	* page 3 - page 5 *		
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X	US-A-3 340 834 (G. ROSSO; M. PROTASONI)	1	
	* column 4, line 14 - column 5, line 64 *		
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X	US-A-3 487 797 (A. PELOGGIO)	1	
	* column 5, line 39 - line 72 *		
	* column 7, line 33 - line 75 *		
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A	DE-A-2 027 447 (FRANZ FALKE-ROHEN, STUMPFWARENFABRIKEN GMBH)		
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A	US-A-3 060 874 (E.J. WICK; H.W. DAY)		
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D,A	EP-A-0 456 186 (CALBREV S.R.L.)		
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			TECHNICAL FIELDS SEARCHED (Int. Cl.5)
			D05B
The present search report has been drawn up for all claims			
Place of search THE HAGUE		Date of completion of the search 28 SEPTEMBER 1992	Examiner D HULSTER E.W.F.
CATEGORY OF CITED DOCUMENTS			
X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document		T : theory or principle underlying the invention 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	