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(54) Improved thread guide particularly for guiding elastic threads in knitting machines for manufacturing socks, stockings, or the like.

(57) The improved thread guide (1), particularly for elastic threads in knitting machines for manufacturing socks, stockings, or the like, comprises a rod (2) in which at least one passage (8) for a thread (9) is defined. The passage (8) leads out proximate to a longitudinal end of the rod (2) which is arrangeable proximate to the workspace of the needles of a knitting machine or the like. A thread locking element (15) is provided along the path followed by the thread (9) on the rod (2) and is activated upon a return of the thread (9) fed through the passage (8).

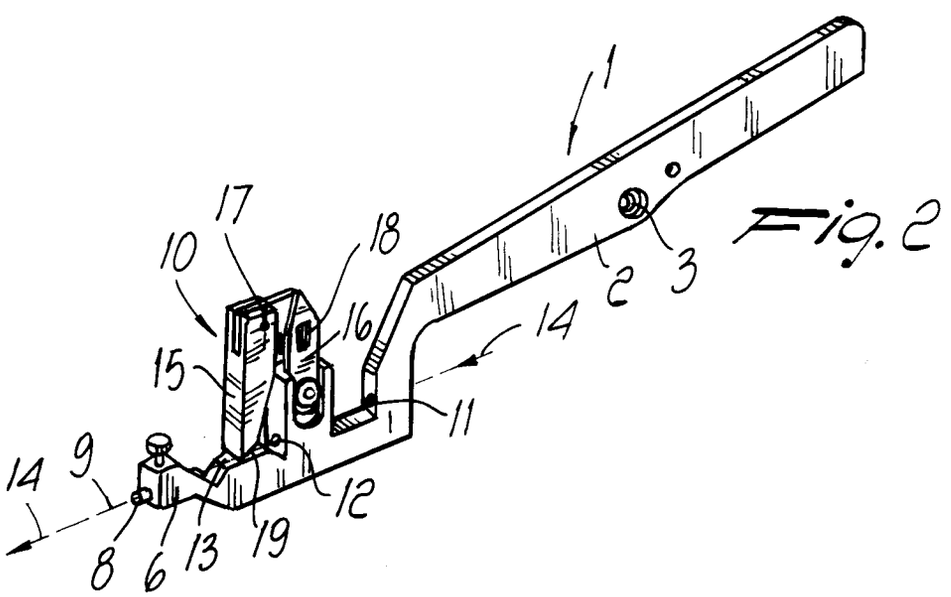

Fig. 2

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The present invention relates to an improved thread guide particularly for guiding elastic threads in knitting machines for manufacturing socks, stockings, or the like, and particularly for medium-diameter circular knitting machines such as machines for manufacturing underpants, undershirts, body stockings, etc.

As known, in small- and medium-diameter single-cylinder circular machines for knitting which requires the cutting of threads at the end of a portion of knitting, there is a cutter arranged above the needle cylinder and coaxially thereto. More particularly, said cutter is substantially constituted by a disk which is rigidly associated with the needle cylinder in its rotation about its axis, in rotating-cylinder machines, and is peripherally provided with small teeth which engage the thread to be cut when said thread is no longer engaged by the needles.

In fact, at the end of the knitting of a portion of knitting, the thread guide or guides which supplied the thread or threads to the needles which knitted said portion are raised so that the subsequent needles can no longer engage said thread which, by being engaged with the last needle, and which in the meantime has retracted into the related groove of the needle cylinder, passes, due to the rotation of the needle cylinder with respect to the thread guides, on the side of the tip of the following needles which is directed toward the axis of the needle cylinder. The thread becomes arranged along a chord above the cutter and is engaged by the teeth thereof which face the inner side of the needle cylinder.

A counterblade is arranged downstream of the feed being considered and is constituted by a plate which rests above the cutter in the region of the teeth and cuts the thread when the tooth which has engaged said thread arrives at said plate.

A suction nozzle is arranged between the counterblade and the thread feed and is directed toward the upper face of the cutter; by means of a continuous stream of air, the nozzle retains the end of the thread fed by the related thread guide when said thread is cut, in order to prevent it from returning towards the thread guide and to consequently prevent interference with the other threads being fed. The suction nozzle is arranged proximate to the thread feed so as to keep said thread orientated along a direction which is radial with respect to the needle cylinder in order to facilitate the engagement of said thread by the needles when the related thread guide is lowered again, i.e. at the beginning of a new row or knitting portion for which the use of that thread is required.

In the use of elastic threads, problems are encountered in retaining the thread by means of suction nozzles, particularly when the thread is subjected to tensing during knitting. In this case, in fact, after the cutting operation has been performed by the cutter, the thread elastically shortens and returns towards the thread guide, since the suction nozzle does not exert on the thread a force sufficient to overcome the elastic reaction of the thread.

With threads having a high degree of elasticity, the shortening of the thread can be such as to cause the complete escape of the thread from the related thread guide, thus compulsorily requiring the halting of the machine and the intervention of an operator to restore the correct feed of the thread.

Thread cutting and clamping units are used in order to solve this problem; said units are arranged above the cutter and operate alternatively with respect to said cutter when it is necessary to cut an elastic thread. Although they solve the problem of the possible escape of the elastic thread from the related thread guide, said cutting and clamping units have the disadvantage of requiring, for their operation, appropriate actuation elements which must be controlled by a control unit of the machine, generally a microprocessor, making the programming of said machine complicated.

Since the cutting and clamping units are arranged above the cutter, they can also create problems in design, since they cause problems in arranging other elements required for the operation of the machine in this region, which in turn creates problems during maintenance interventions on the machine.

The aim of the present invention is to obviate the above described disadvantages by providing an improved thread guide which effectively avoids the escape of the thread when it is cut without requiring the use of thread cutting and clamping units arranged above the cutter.

Within the scope of this aim, an object of the invention is to provide a thread guide which allows to use the cutter to cut elastic threads as well as normal threads.

Another object of the invention is to provide a thread guide which, since it does not require thread cutting and clamping units, simplifies the design of the machine and the programming of the electronic control unit which controls its operation.

A further object of the invention is to provide a thread guide which allows to maintain low costs for the elements required for thread feeding.

This aim, these objects and others which will become apparent hereinafter are achieved by an improved thread guide particularly for elastic threads in knitting machines for manufacturing socks, stockings, or the like, which comprises a rod having at least one passage defined therein for a thread, said passage leading out proximate to a longitudinal end of said rod which is arrangeable

proximate to a workspace of needles of a knitting machine or the like, characterized in that thread locking means are provided along the path followed by a thread on said rod and can be activated upon a return of a thread fed through said passage.

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

figure 1 is a lateral elevation view of two thread guides according to the invention in the first embodiment;

figure 2 is a perspective view of a thread guide in the first embodiment;

figures 3 and 4 are lateral elevation views of a thread guide in the first embodiment, illustrating its operation;

figure 5 is a perspective view of a thread guide according to the invention in a second embodiment;

figures 6 and 7 are lateral elevation views of the thread guide illustrated in figure 5, illustrating its operation.

With reference to the above figures, the thread guide according to the invention, indicated by the reference numerals 1, 1a in the two embodiments, comprises a rod 2, 2a which is intended to be pivoted, at an intermediate portion 3, 3a thereof, to a supporting structure 4 which is arranged laterally with respect to the needle cylinder 5 of a circular knitting machine for manufacturing socks, stockings, or the like.

A passage 8, 8a for a thread 9 to be fed to the needles 7 is defined proximate to the longitudinal end 6, 6a of the rod which is intended to be directed toward the needle cylinder 5 in the workspace of the needles 7.

According to the invention, locking means 10, 10a are provided along the path followed by the thread 9 on the rod 2, 2a and are activated when a return of the thread 9 fed through the passage 8, 8a occurs.

More particularly, the rod 2 of the thread guide in its first embodiment has guiding means for the thread 9 which are substantially constituted by channels 11 and 12 defined in the body of the rod 2 and are aligned with respect to the passage 8. Said channels 11 and 12, together with the passage 8, define a sliding path for the thread which is fed through the passage 8.

Along said sliding path, the thread 9 passes above a supporting surface or plane 13 which is arranged directly ahead of the passage 8 along the sliding direction of the thread indicated by the arrow 14.

In this first embodiment, the locking means comprise an element 15 which is pivoted, at its upper end, to a portion 16 of the rod 2 which is arranged above the supporting plane 13. The lower end of the element 15 extends toward the supporting plane 13. The element 15 can oscillate about an axis 17, arranged parallel to and spaced upward with respect to the supporting plane 13 and perpendicular to the sliding direction 14 of the thread 9.

In this manner, the lower end of the element 15 can move toward or away from the supporting plane 13 by oscillating about the axis 17.

The oscillation of the element 15 in the opposite direction with respect to the delivery end 6 of the thread guide is limited by the presence of the portion 16, and return means act on the element 15 and bias the oscillation thereof toward the thread delivery end 6.

If the element 15 is made of ferromagnetic material, said return means can be conveniently constituted, as in the illustrated case, by a permanent magnet 18 associated with the portion 16 of the rod 2 and orientated toward the element 15.

The lower end of the element 15 has, on the opposite side with respect to the end 6, a level or chamfer 19 which forms an acute angle with respect to the sliding direction 14 of the thread on the supporting plane 13.

In this manner, when the thread 9 is fed, by means of the traction performed by the needles which engage it, the contact itself of the thread keeps the lower end of the element 15 at a distance from the supporting plane 13 which is sufficient to ensure the correct sliding of the thread 9. A return of the thread 9 in the direction opposite to the feed direction causes the oscillation of the element 15 in the opposite direction, i.e. it causes the lower end of the element 15 to move closer to the supporting plane 13, and the thread 9 is pressed and thus locked between the element 15 and the supporting plane 13. The oscillation of the element 15 during the return of the thread 9 is caused not only by contact with said thread but also by the action of the magnet 18.

Said magnet 18 can be replaced with a simple return spring which is not illustrated for the sake of simplicity.

In the second embodiment, channels 11a and 12a and a supporting plane 13a are defined in the rod 2a similarly to what has already been described with reference to the first embodiment.

In this second embodiment, the locking means comprise an elastically flexible lamina 15a which is fixed, at its upper end, to a portion 16a of the rod 2a, arranged above the supporting plane 13a and upstream of the supporting plane 13a along the sliding direction 14 of the thread 9.

The lower end of the lamina 15a rests on the

plane 13a, forming an acute angle with respect to the sliding direction 14 of the thread 9.

In this manner, an advancement of the thread 9 along the sliding direction 14 is allowed by the elastic oscillation of the lamina 15a caused by the contact itself of the thread 9, whereas a return of the thread 9 in the opposite direction causes the locking of the thread 9, which is pressed by the lamina 15a against the supporting plane 13.

The thread guide according to the invention can be adopted in replacement of conventional thread guides and can be actuated in the same way as conventional thread guides, for example by means of electromagnetic actuators 20 and springs 21.

The operation of the thread guide according to the invention is evident from the above description and from the drawings, and in particular it is evident that by cutting the thread 9 on the machine it is not necessary to provide a device for clamping the cut thread 9, since its return toward the thread guide is blocked by the element 15 or by the lamina 15a directly on the thread guide. Even in the case of very elastic threads, in view of the small distance between the thread locking point and the delivery end of the thread guide, the portion of thread 9 which remains protruding from the thread guide is long enough to be engaged by the needles at the beginning of a new knitting.

In practice it has been observed that the thread guide according to the invention fully achieves the intended aim, since it avoids the use of the cutting and clamping units used so far for elastic threads, while effectively preventing the escape of the thread from the thread guide.

The thread guide 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 to 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. Improved thread guide particularly for elastic threads in knitting machines for manufacturing socks, stockings, or the like, which comprises a rod having at least one passage defined therein for a thread, said passage leading out proximate to a longitudinal end of said rod which is arrangeable proximate to a workspace of needles of a knitting machine or the like, characterized in that thread locking means are provided along the path followed by the thread on said rod and can be activated upon a return of the thread fed through said passage.

2. Thread guide according to claim 1, characterized in that thread guiding means are provided along said rod and define a sliding path which passes above a supporting plane arranged proximate to said longitudinal end of said rod, said locking means being movable toward or away from said supporting plane for clamping a thread between said supporting plane and said locking means.

3. Thread guide according to claims 1 and 2, characterized in that said locking means comprise an elastically flexible lamina which is fixed, at one of its ends, to a portion of said rod arranged above said supporting plane and is arranged upstream of said portion along to the sliding direction of the thread, said lamina extending with its other end toward said supporting plane and forming an acute angle with respect to the sliding direction of the thread on said supporting plane.

4. Thread guide according to one or more of the preceding claims, characterized in that said locking means comprise an element pivoted at one of its ends to a portion of said rod arranged above a supporting plane, the other end of said element extending toward said supporting plane and being oscillatable, about an axis parallel to said supporting plane and perpendicular to the thread sliding direction, away from said supporting plane against a biasing action of return means.

5. Thread guide according to one or more of the preceding claims, characterized in that said return means are constituted by a magnet fixed to said portion of the rod arranged above said supporting plane, said magnet being orientated toward an element made of ferromagnetic material for the oscillation thereof toward said supporting plane.

6. Thread guide according to one or more of the preceding claims, characterized in that the end of said element which is directed toward said supporting plane has a chamfer which forms an acute angle with respect to the sliding direction of the thread on said supporting plane.

7. Thread guide according to one or more of the preceding claims, characterized in that said return means are constituted by a spring.

8. Thread guide according to one or more of the preceding claims, characterized in that said guiding means comprise channels defined in said rod ahead of said supporting plane along the thread sliding direction and are aligned with said passage.

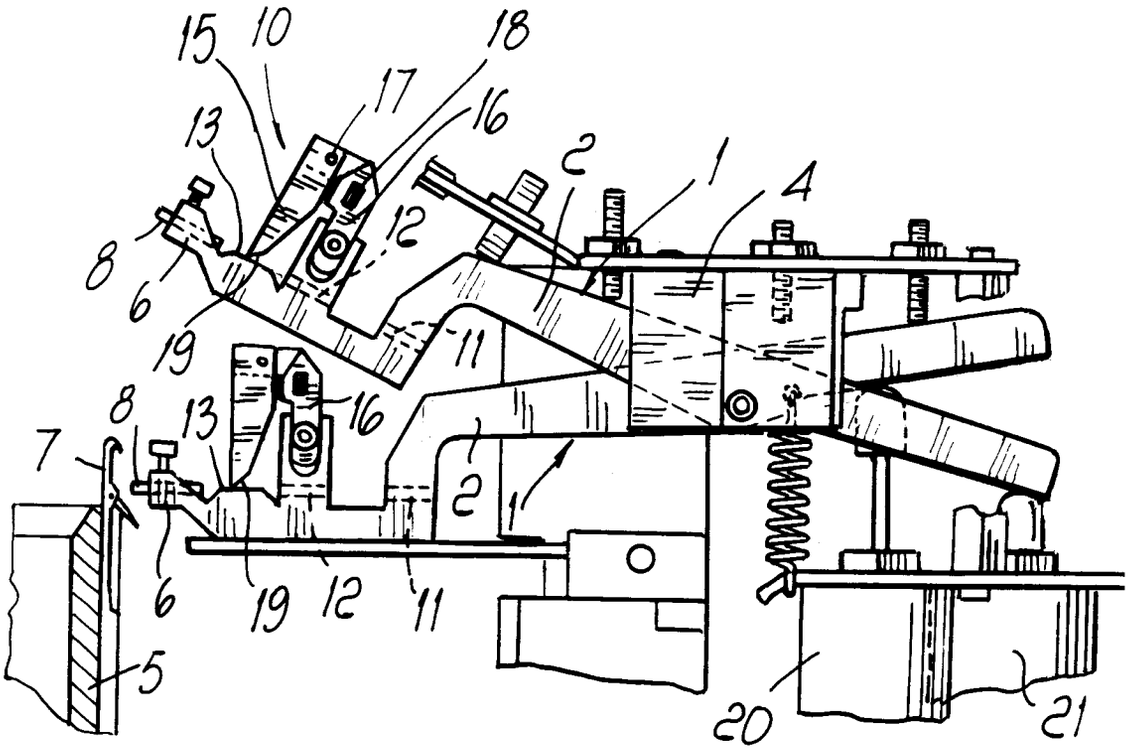

Fig. 1

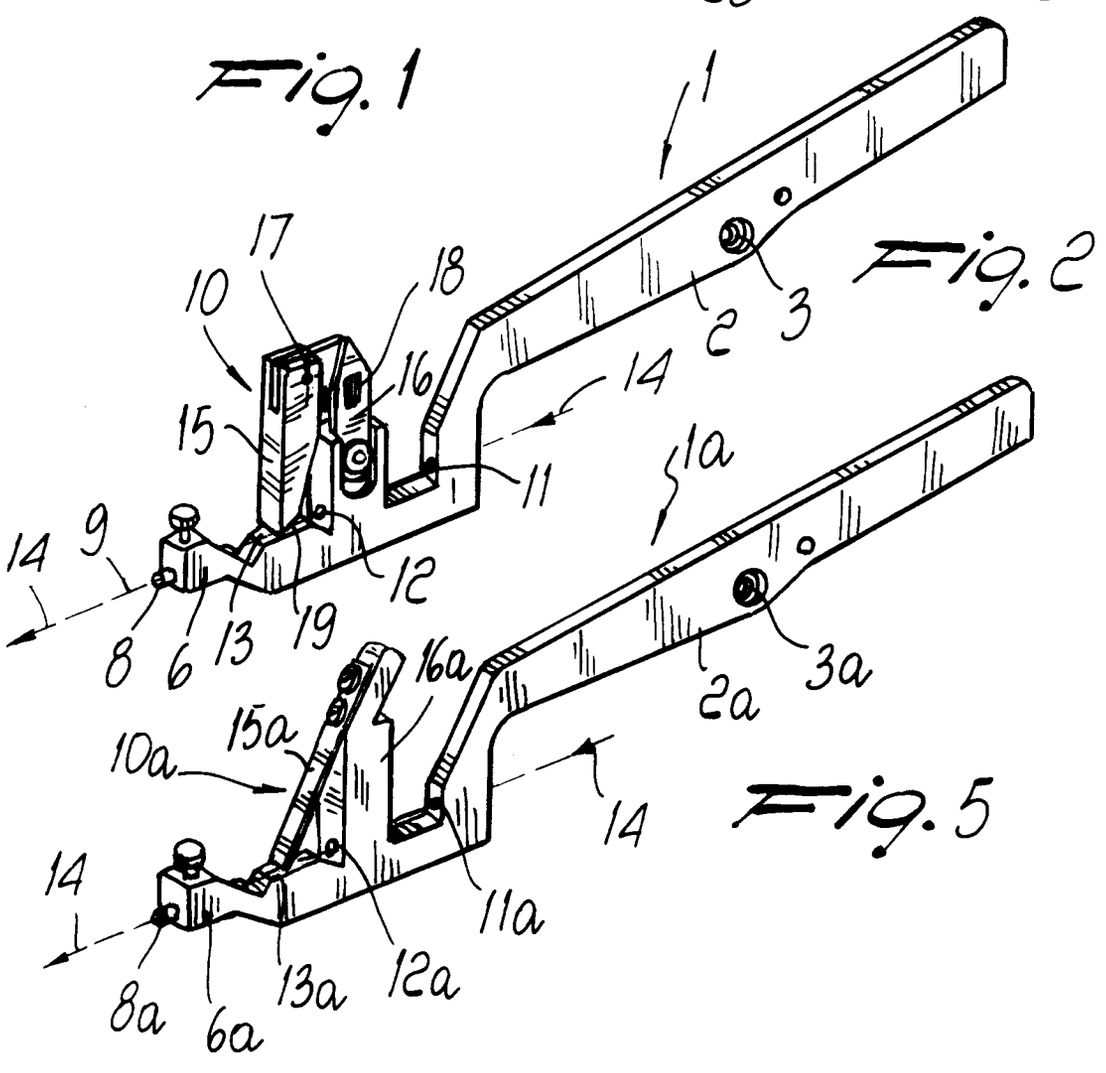

Fig. 2

Fig. 5

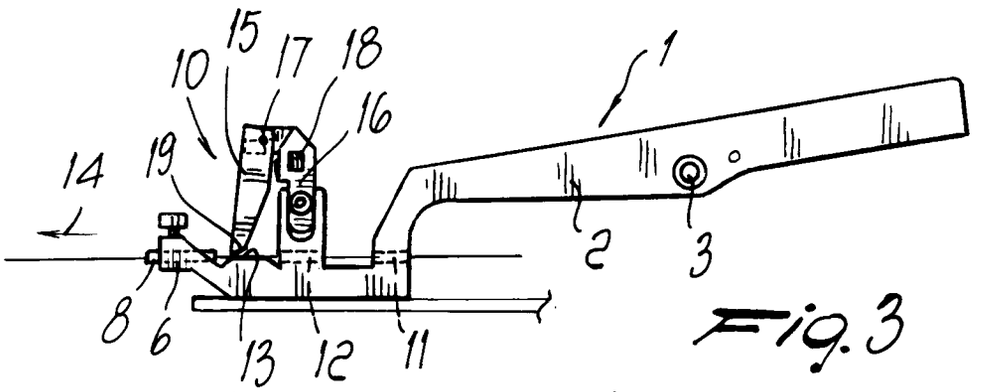

Fig. 3

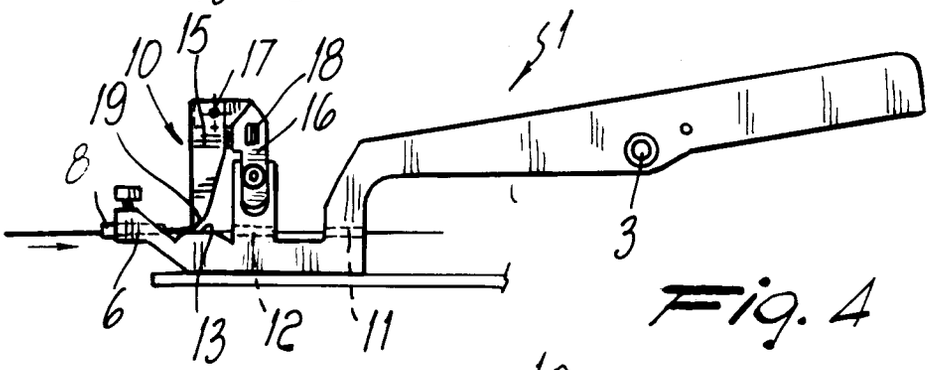

Fig. 4

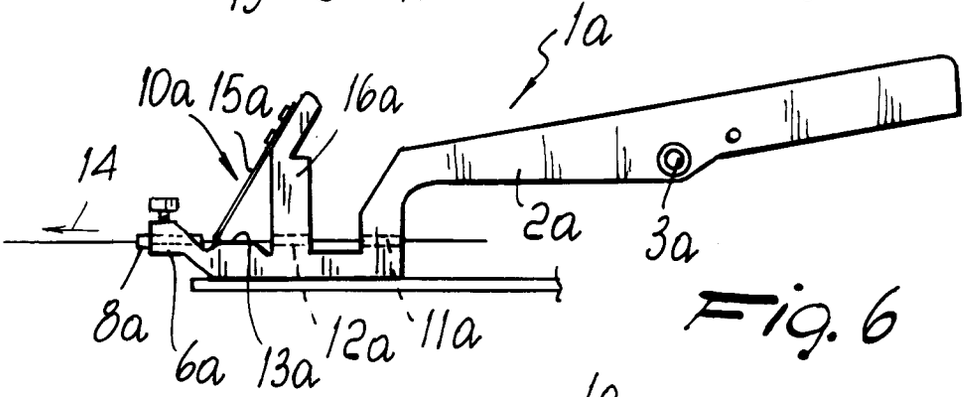

Fig. 6

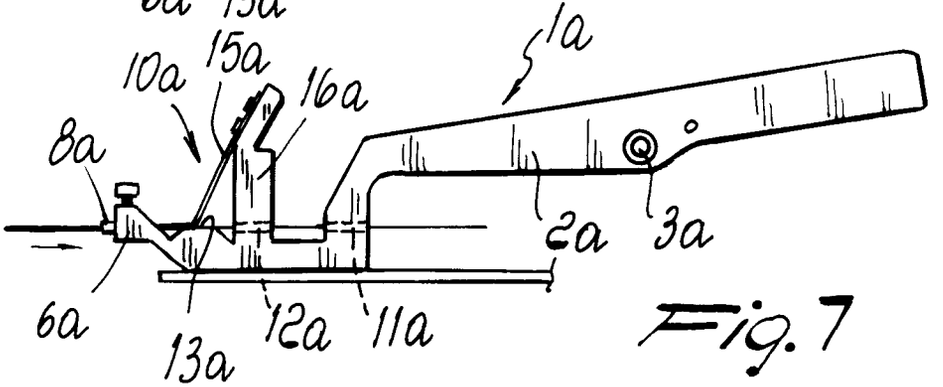

Fig. 7

European Patent Office

EUROPEAN SEARCH REPORT

Application Number EP 91110946.0

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 - 2 040 022 (BILLI) * Totality *	1,2,4, 6	D 04 B 15/60
Y		3,7,8	
Y	CH - A5 - 650 815 (VEB TEXTIMA) * Totality *	3,7,8	
A	GB - A - 1 553 051 (LONATI)		
A	GB - A - 1 385 103 (ELITEX)		

TECHNICAL FIELDS SEARCHED (Int. Cl.5)

D 04 B 15/00

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
VIENNA	18-10-1991	BAUMANN

CATEGORY OF CITED DOCUMENTS

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