(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) Publication number : **0 645 485 A1**

(12) EUROPEAN PATENT APPLICATION

(21) Application number : **94114955.1**

(51) Int. Cl.[6] : **D03D 51/34**

(22) Date of filing : **22.09.94**

(30) Priority : **23.09.93 IT MI932037**

(43) Date of publication of application :
29.03.95 Bulletin 95/13

(84) Designated Contracting States :
BE CH DE ES FR IT LI

(71) Applicant : **SOMET SOCIETA' MECCANICA TESSILE S.p.A.**
Provinciale Valseriana Km. 23
I-24020 Colzate-Bergamo (IT)

(72) Inventor : **Granelli, Renato**
Via Roma, 14
I-24020 Gorle, Bergamo (IT)
Inventor : **Viscardi, Ettore**
Via G. Rossini, 12
I-24027 Nembro, Bergamo (IT)

(74) Representative : **Faggioni, Marco, Dr. Ing. et al**
c/o Fumero Studio Consulenza Brevetti
Franz-Joseph-Strasse 38
D-80801 München (DE)

(54) Pneumatic weft tensioning safety device for air looms, with control of the broken wefts.

(57) Pneumatic weft tensioning safety device for air looms, of the type in which a weft yarn (F) is launched by air jets into a launching channel (5) formed in the loom reed (3) and, at the outlet of the shed, the free end of said yarn is deviated towards the inlet mouth of a lateral weft tensioning channel (11) by an air jet (12) substantially transversal to the direction of said launching channel (5). The lateral weft tensioning channel (11) has an arc-shaped path and leads into a channel extension (6) of said launching channel (5). Means (13) to detect the presence of the weft are positioned in said channel extension (6), downstream of the outlet mouth of said lateral channel (11).

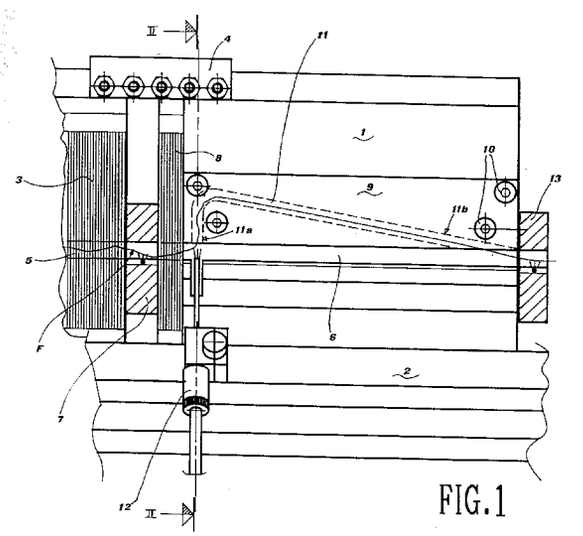

FIG.1

EP 0 645 485 A1

The present invention concerns a pneumatic weft tensioning safety device for air looms, providing for an efficient and unfailing control of any broken wefts, independently from how the weft may appear at the outlet of the shed due to breakage.

It is known that, in air looms, the weft yarn is fed and guided along the loom shed by a first air jet, blown by a main nozzle positioned at the inlet of the shed, and by a plurality of intermediate air jets, blown by secondary nozzles positioned at regular intervals along the shed. The weft yarn, driven by these compressed air jets, moves along a channel having a substantially C-shaped cross section, defined by the dents of the reed having, for the purpose, a fully special configuration.

The improvements introduced in the technique of air looms have led to a progressive increase in the speed of weft insertion into the shed, to the point that it has become particularly difficult to provide for a proper control of the weft. It has been noticed in particular that, when the weft yarn is suddenly stopped by the feeding devices, at the end of insertion, it starts to undergo a plurality of longitudinal oscillations determined by the elongations and spring-backs to which it is subjected due to its sudden stopping. The weft yarn hence settles in a longitudinal sense only when these oscillations have come to an end.

Nevertheless, the time taken for said oscillations to fully dampen is longer than the time elapsing between the insertion of a weft and that of the following weft, whereby - in these conditions - the fabric being formed may most likely include also loose wefts or, alternatively, over-stretched wefts, which in any case determine the presence of faults therein.

To solve these problems, it has already been proposed to increase the blowing time of the last secondary nozzles. However, this solution - besides determining an increase in compressed air consumption and, thus, in the weaving energy costs - can also cause defects in the fabric, due to the high stresses to which the warp yarns may be subjected, during closing of the shed, on account of an exceedingly long blowing time of said last nozzles.

According to another more convenient solution, it has been proposed to arrange, on the loom side opposite to that of weft insertion, suction or blowing devices which provide to grip the weft, keeping it tensioned up to the end of reed beating up. This type of devices successfully solves the above problem of the prompt settlement of the weft yarn in the longitudinal sense. Nevertheless, also these devices involve a drawback, which is particularly felt when weaving medium and high-quality fabrics.

In fact, the looms meant for this type of weaving are now-a-days more and more often equipped with a double system to control the weft at its arrival, on the loom side opposite to that of weft insertion. To a first photoelectric cell - always present and positioned at the outlet of the shed, in order to control the correct arrival of the weft yarn and thus issue a consent signal for the following weft yarn to be fed - there is associated a second photoelectric cell, positioned along the extention of the weft launching channel, at a suitable distance from the first photoelectric cell.

The regular working of the loom is characterized by the fact that this second cell does not detect the presence of a weft yarn. In fact, if said second cell detects a weft yarn, it means either that said weft yarn is too long - whereby a fault needs to be corrected in the feeding devices - or that it has partially or totally broken; in both cases, a manual operation of control is required on the loom. Hence, when said second photoelectric cell detects the presence of a weft yarn, it promptly sends a stop signal to the loom.

From the above it appears quite evident that, when the weft yarn is deviated from the rectilinear path of the launching channel, so as to be able to perform the pneumatic tensioning thereof, it is no longer possible to control with the second photoelectric cell the presence of any long or broken weft yarns, since these are deviated into a transversal tensioning channel into which it is thus necessary to place a third photoelectric cell for weft yarn control. The presence of the second photoelectric cell is anyhow indispensable to detect any long or broken weft yarns which have not been deviated by the pneumatic weft tensioning device, either due to a faulty working thereof, or because the broken weft yarn passes in front of said tensioning device before this latter has started its blowing action. It is evident that the above solution involves further complications and plant costs, both due to the presence of the third photoelectric cell and of the respective electronic control system, and because of the need to form an outlet channel for the pneumatic weft tensioning device which is longer than normal, so as to allow placing therein said photoelectric cell in a position sufficiently far from the position normally reached by the end of the regular weft yarns.

The object of the present invention is to thus supply a pneumatic weft tensioning device free from the above drawback, that is, allowing to perform a correct pneumatic tensioning of the weft yarn and to simultaneously control, without fail, the presence of any long or broken wefts.

According to the present invention, said object is reached by means of a pneumatic weft tensioning safety device for air looms - of the type in which a weft yarn is launched by air jets into a launching channel formed in the loom reed and, at the outlet of the shed, the free end of said yarn is deviated towards the inlet mouth of a lateral channel by an air jet substantially transversal to the direction of said launching channel - characterized in that it comprises an extension to said launching channel, into which leads the outlet mouth of said lateral channel, and means to detect the

presence of the weft, positioned in said channel extension downstream of the outlet mouth of said lateral channel.

Further characteristics and advantages of the device according to the present invention will anyhow be more evident from the following detailed description of some preferred embodiments thereof, given by way of example and illustrated on the accompanying drawings, in which:

Fig. 1 is a front view of the pneumatic weft tensioning safety device according to the present invention;

Fig. 2 is a cross-section view of the same device, along the line II-II of fig. 1;

Fig. 3 is a view, similar to that of fig. 1, of a second embodiment of the pneumatic weft tensioning safety device of the present invention; and

Fig. 4 is a cross-section view, along the line IV-IV of fig. 3.

The pneumatic weft tensioning safety device according to the invention is positioned, as already said, on the loom side opposite to that of weft insertion. In the first embodiment illustrated in figs. 1 and 2, said device consists of a plate 1 - preferably made of a light alloy - fixed to the sley 2 and having a cross section similar to that of the reed 3, to which it is fixedly connected through a clamp board 4. In this way, the launching channel 5 formed by the dents of the reed 3 extends, at the outlet of the shed, into a channel 6 formed in the plate 1, said channel 6 having the same cross-section as the channel 5 and being aligned therewith. Between the reed 3 and the plate 1 there are interposed a first photoelectric cell 7, controlling that the weft yarn regularly reaches the outlet side of the shed, and a small lateral reed 8 allowing to form the split selvedge.

A cover 9 is fixed to the plate 1 by screws 10. Into the inner part of the cover 9 there is formed, by suitable machining, a channel 11 for weft yarn tensioning. The channel 11 has an initial length 11a, on the side close to the reed 8, which leads into the extension channel 6 in a direction substantially perpendicular thereto, and a final length 11b which leads into said extension channel 6 further downstream thereof, in a direction almost tangential thereto. The two lengths of the channel 11 are radiused with a variably arc-shaped path, formed in such a way as to oppose the least possible resistance to the advancement therein of the free weft yarn end. The inner surface of the channel 11 and the corresponding surface of the plate 1 should thus be machined in a particularly accurate manner so as to avoid the presence of any roughness which may hinder the regular advancement of the weft yarn inside said channel.

On the wall of said extension channel 6 opposite to the inlet mouth of said starting length 11a of the channel 11, there is provided a pneumatic blow device 12 apt to send an air jet across said channel 6, so as to deviate the free weft yarn end into the channel 11 as soon as it emerges from the reed 8.

At the outlet end of the extension channel 6 there is finally positioned a second photoelectric cell 13, apt to detect the presence of the weft yarn emerging both from said channel 6 and from the tensioning channel 11.

The whole aforedescribed pneumatic weft tensioning device is finally apt to slide along the sley 2 and to be fixed thereto in a position at will, by known-type clamping means, according to the transversal dimensions of the reed being used each time.

During regular working of the loom, the weft yarn F is launched in known manner into the launching channel 5, by the main nozzle and by the secondary nozzles (not shown), until it leaves the shed and emerges from the reed 8. The correct arrival of the weft yarn in this area is detected by the photoelectric cell 7 which confirms that weaving can be continued. At this point the loom control system operates the blow device 12, by way of a special solenoid valve (not shown), and the air jet blown by said device 12 deviates the weft yarn into the channel 11, wherein said yarn promptly settles both due to the tensioning it undergoes on account of said air jet and due to the friction it undergoes when contacting the walls of the channel 11, especially along its deeply curved path. The free weft yarn ends, which thus penetrate into the channel 11, will be subsequently drawn out therefrom together with the split selvedge - as the fabric weaving process continues - and be eliminated therewith.

When there is a fault in the working of the loom - either due to a long weft or to a broken weft yarn - said weft yarn, no longer restrained by the feeding device, follows its path along the lateral channel 11 up to reaching again the channel 6 where it is detected by the photoelectric cell 13, which thus immediately sends a stop signal to the loom. Since the presence of short wefts is detected by the photoelectric cell 7, it appears evident that the device of the present invention is apt to perform a perfect and safe control of any possible faults which may occur in weft insertion, thereby guaranteeing the highest reliability for what concerns the quality of the fabric being woven.

It is important to note that the above result is obtained in any case, independently from how weft breakage may have occurred, or from whether the broken weft yarn may or not have got entangled in the warp yarns after breakage. In fact, either through the channel 11 or directly along the channel 6, the long or broken weft yarn anyhow arrives in front of the photoelectric cell 13, causing the stopping of the loom.

A second embodiment of the pneumatic weft tensioning safety device according to the present invention has been conceived for the purpose of obtaining a smaller amount of yarn waste and a more homogeneous quality thereof, so as to allow its subsequent

re-use.

Said embodiment is illustrated in figs. 3 and 4. As clearly shown in said figures, the pneumatic weft tensioning device illustrated therein is fully identical to the one previously described with reference to figs. 1 and 2, except that it does not comprise the small lateral reed 8 whose function is performed by a cutter 14, suitably operated by a pneumatically or electromagnetically controlled linear actuator 15.

As known, the function of the strip of fabric formed by the reed 8 is to simply keep the weft yarn tails properly stretched and in order so that, when the split selvedge strip is cut off from the fabric, said weft yarn tails form a perfectly regular fringe. Thanks to the weft tensioning device of the present invention, however, each weft yarn is already perfectly stretched and in-line when reed beating up takes place, whereby it is possible to provide for the cutting thereof with the cutter 14 while the blow device 12 is operating, which allows to obtain the same result seen above in the case of the split selvedge, namely a weft tails fringe of perfectly uniform width.

The weft tails cut by the cutter 14 are driven into the channel 11 by the blow device 12, and are then sucked in known manner - into a can for gathering the weft yarn ends - by means of a suction funnel 16 facing the outlet of the channel 6.

To allow a proper working of the photoelectric cell 13 also in this second embodiment of the invention, the respective control program should provide for the signal sent by said cell to be ignored from the moment in which the cutter 14 starts to work and for a length of time sufficient to allow the passage of the cut weft tail through channels 11 and 6. This prevents the periodic outlet of the cut tails, passing in front of the photoelectric cell 13, from determining false warning signals. During the remaining time interval of each weaving cycle the controlling function of said photoelectric cell remains unaltered, so as to indicate the presence of any long or broken wefts, as explained above.

From the above description, it is evident how the weft tensioning device of the present invention has fully reached its intended object. It in fact allows to fully and safely control any possible type of fault in the weft - without requiring the presence of any additional weft detection means, apart from those already provided now-a-days on looms without a pneumatic weft tensioning device - just thanks to the special by-pass configuration of the weft tensioning channel.

It is evident that the protection of the pneumatic weft tensioning safety device according to the present invention should not be limited to the particular embodiments described heretofore, but should extend to any other possible embodiments thereof, within reach of a technician skilled in the art, falling within the scope of the following claims.

Claims

1) Pneumatic weft tensioning safety device for air looms - of the type in which a weft yarn (F) is launched by air jets into a launching channel (5) formed in the loom reed (3) and, at the outlet of the shed, the free end of said yarn is deviated towards the inlet mouth of a lateral channel (11) by an air jet (12) substantially transversal to the direction of said launching channel (5) - characterized in that it comprises an extension (6) to said launching channel (5), into which leads the outlet mouth of said lateral channel (11), and means (13) to detect the presence of the weft, positioned in said channel extension (6) downstream of the outlet mouth of said lateral channel (11).

2) Weft tensioning device as in claim 1), wherein the distance of said detection means (13) from the outlet of the shed is sufficient to make sure that the ends of the regular wefts do not interfere therewith.

3) Weft tensioning device as in claim 2), wherein said detection means (13) send a warning signal when detecting in front of them the presence of a weft.

4) Weft tensioning device as in any one of the previous claims, wherein said detection means (13) consist of a photoelectric cell.

5) Weft tensioning device as in any one of the previous claims, comprising a support plate (1) having a cross section similar to that of the reed (3), so as to form said channel extension (6), and a cover (9) apt to be fixed to said plate (1) by screw means (10), into which are formed at least three walls of said lateral channel (11), the fourth wall consisting of said support plate (1).

6) Weft tensioning device as in any one of the previous claims, wherein the initial length (11a) of said lateral channel (11) is substantially perpendicular to said channel extension (6), and the final length (11b) thereof is almost tangential to said channel extension (6).

8) Weft tensioning device as in any one of the previous claims, comprising moreover a weft yarn cutting device (14), positioned on the loom side opposite to that of weft insertion, between the reed (3) and the inlet mouth of said lateral channel (11).

9) Weft tensioning device as in claim 8), wherein said detection means (13) are stopped from operating as soon as said cutting device (14) cuts the weft yarn, and for the length of time required to allow the cut yarn to pass in front of said detection means (13).

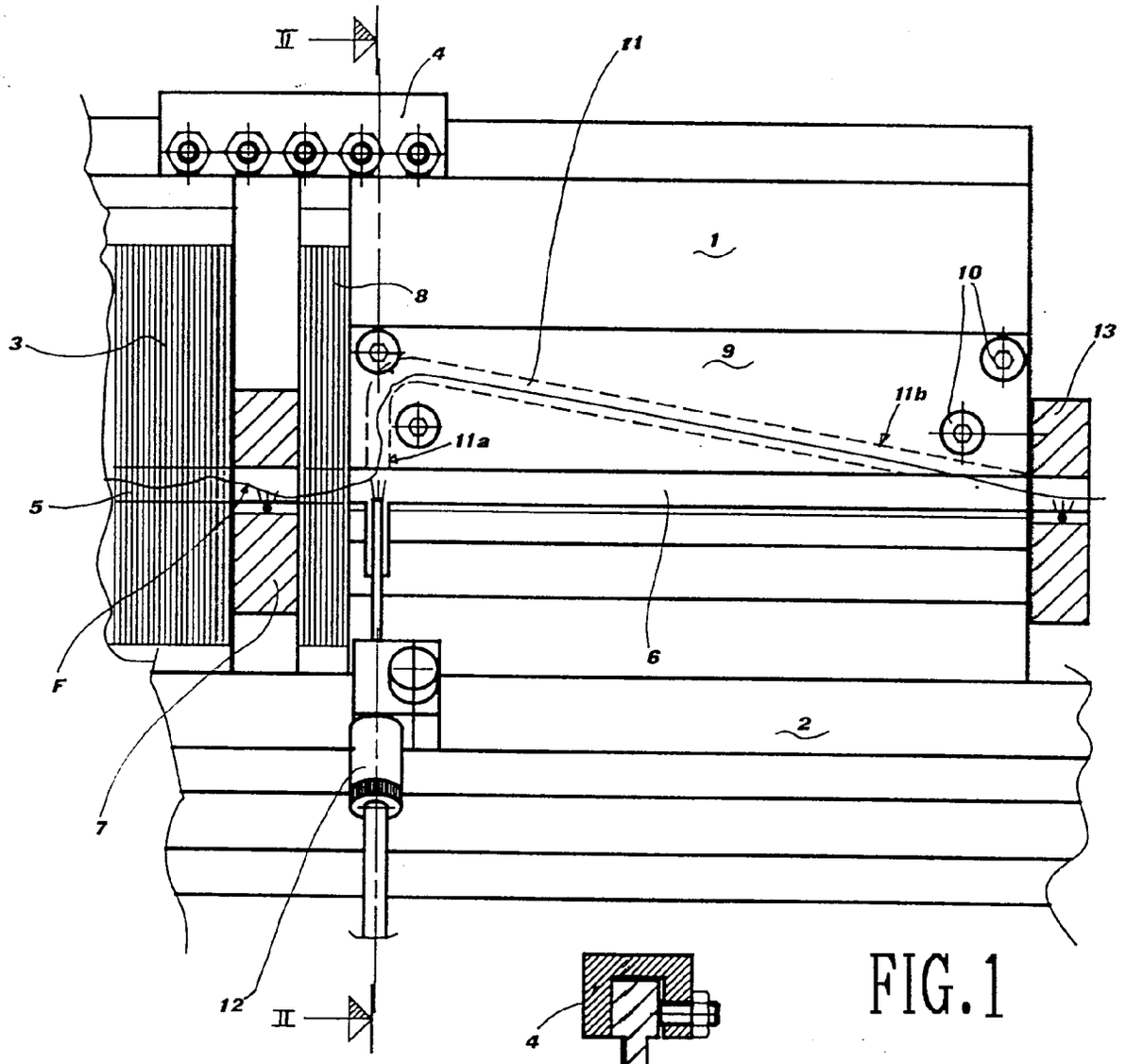

FIG.1

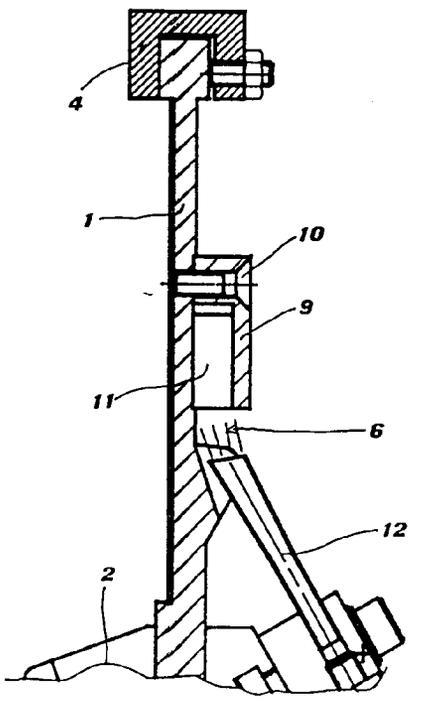

FIG.2

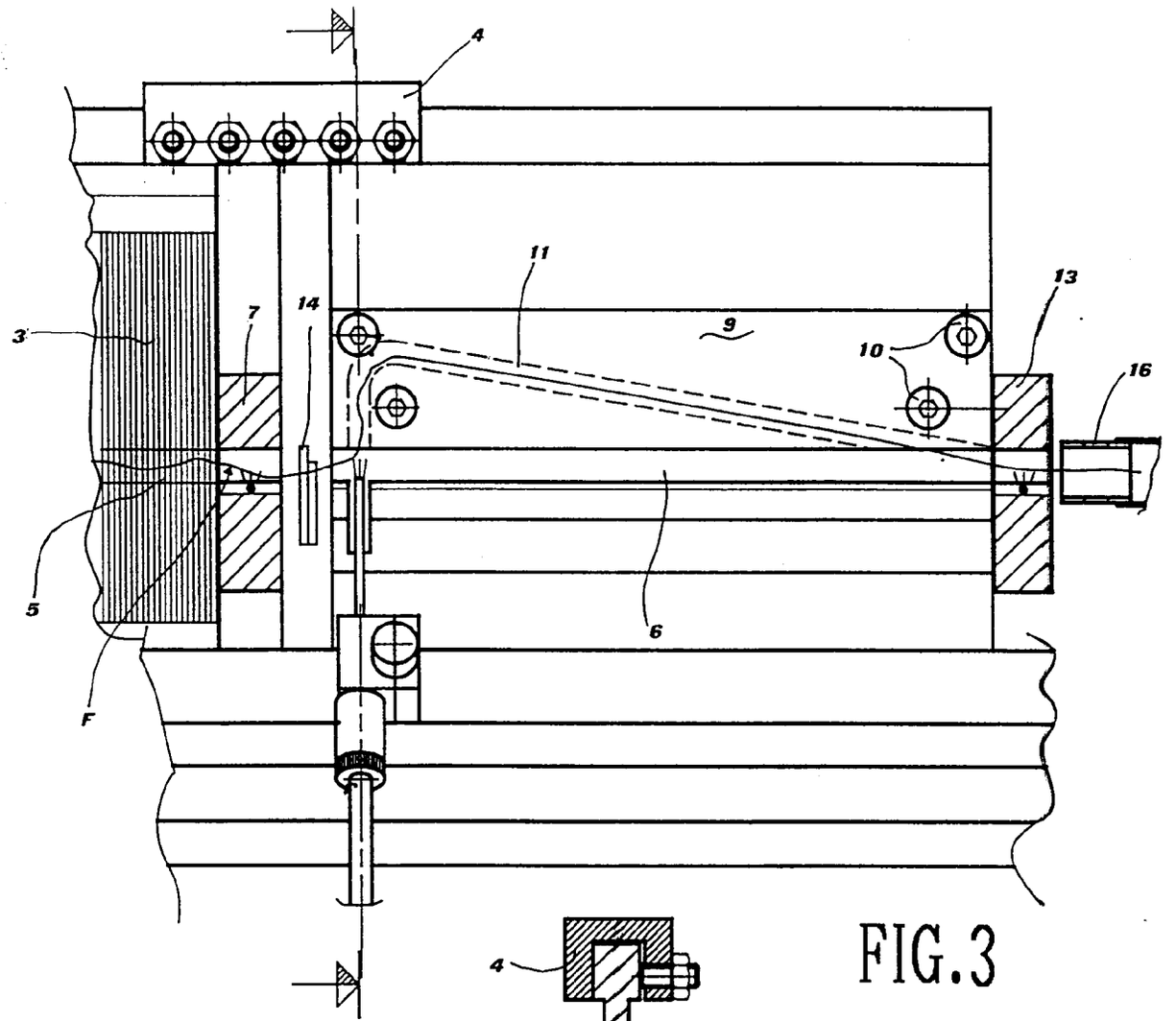

FIG.3

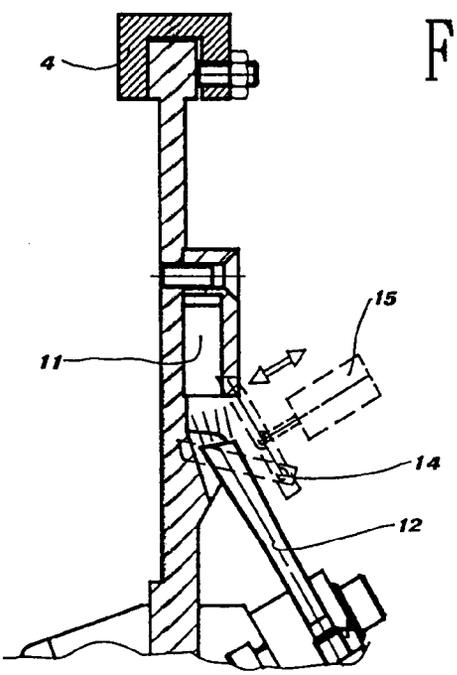

FIG.4

European Patent Office

EUROPEAN SEARCH REPORT

Application Number
EP 94 11 4955

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.6)
X	FR-A-2 497 841 (RUTI) * claim 1; figure 1 * ---	1-4	D03D51/34
A	FR-A-2 494 731 (RURI) * claim 1; figures 1,2 * ---	1-5	
A	US-A-4 962 794 (WHITE) * abstract; figure 2 * -----	1	

TECHNICAL FIELDS SEARCHED (Int.Cl.6)

D03D

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	23 November 1994	Boutelegier, C

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

EPO FORM 1503 03.82 (P04C01)