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

(11) EP 0 808 926 A1

(12) EUROPEAN PATENT APPLICATION

(43) Date of publication:
26.11.1997 Bulletin 1997/48

(51) Int. Cl.⁶: D03D 49/22

(21) Application number: 97108493.4

(22) Date of filing: 21.05.1997

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

(30) Priority: 22.05.1996 IT MI960383 U

(71) Applicant:
SOMET SOCIETA' MECCANICA TESSILE S.p.A.
24020 Colzate-Bergamo (IT)

(72) Inventor: Tasca, Egidio
24052 Azzano San Paolo (Bergamo) (IT)

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

(54) Warp yarn guiding roller of composite material for looms

(57) The present invention concerns an oscillating warp yarn guiding roller for looms, of the type supported at the ends by levers (9) alternately oscillating in opposition to spring means (8), which consists of a pair of aligned short metal shafts (3b) perpendicular to said levers (9) to which they are fixed at their outer end, while their inner facing ends are reciprocally connected through a thin pipe coupling (12), and of a hollow cylinder (3a) of composite material freely rotating around the pair of short metal shafts (3b), through bearings (11) mounted onto said shafts (3b). Preferably, the composite material of the hollow cylinder (3a) is based on carbon fibres.

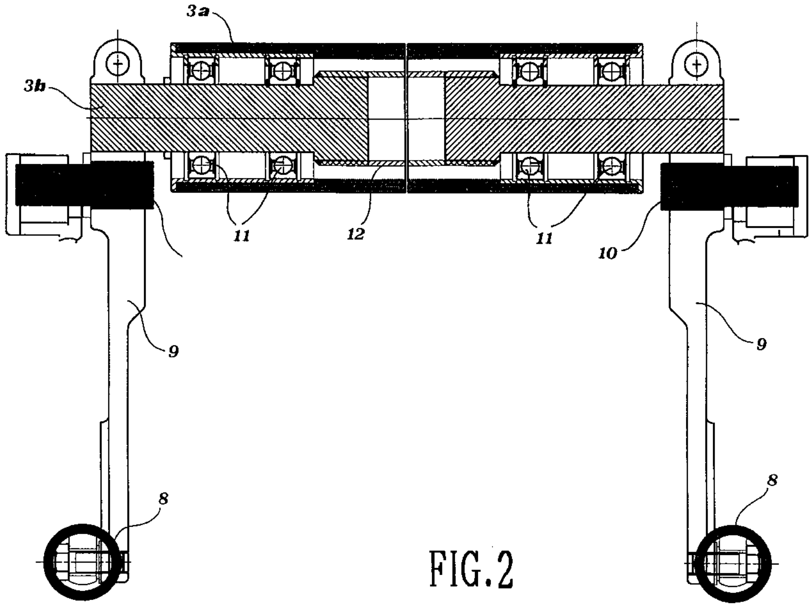

FIG.2

EP 0 808 926 A1

Description

The present invention concerns a warp yarn guiding roller for use in looms, and particularly suited to work on high speed looms.

It is known that, in weaving looms, the motion law of the single machine components follows a cyclic movement and, consequently, many of the members have to perform a reciprocating motion wherein the movements and stresses cyclically undergo an alternate inversion of direction.

These alternate stresses involve also the warp yarns extending between the warp beam and the take-up roller through the heald frames and the reed. In fact, at intervals, the warp yarns are tensioned and released by the alternate action of the healds, and they are put under tensile stress by reed beating-up. If the end positions of the warp yarns were to be blocked, or if no means were provided to release the tensile stresses cyclically imparted thereon, such yarns would risk breaking after a short number of cycles.

To prevent the tension imparted on the warp yarns during weaving from thus leading to the breakage thereof, one usually provides for one of the two end positions of said yarns to be elastically movable; more precisely, the end position in correspondence of the warp yarn guiding roller which is positioned, transversally to the warp, between the heald frames and the beam. Said guiding roller thus performs a double function: on one hand, it helps to deviate the path of the warp yarns unwound from the beam in a direction apt to answer the requirements imposed by the geometry of the loom; on the other hand, since said guiding roller is mounted oscillating in respect of an axis parallel to its longitudinal axis, it allows to release the tensile stresses imparted on the warp yarns being guided thereon, by elastically favouring the stretching and shortening undergone by said yarns. The tension on the warp yarns thus remains substantially constant and it can be suitably regulated by adjusting the stiffness of return springs provided in correspondence of the levers supporting the guiding roller.

Said warp yarn guiding roller can be supported and controlled with different systems, according to the type of loom on which it is mounted and to the functions having to be performed thereby. In any case, it must answer the fundamental requirement of stoutness and stiffness. In fact, although the tension imparted on a single warp yarn is fairly low (within a range between 0.01 and 1 kg), the global force which thousands of warp yarns discharge onto the guiding roller can reach several tons. In spite of the heavy load applied thereon, the guiding roller should positively not undergo even the slightest flexural deformation, since this would prejudice a uniform support for the warp yarn, thereby compromising the quality of the fabric being woven. This problem is made worse by the fact that the width of the loom, i.e. the length of the warp yarn guiding roller, is relatively high, varying between 1 and 5 meters.

According to known technique, two alternative solutions are adopted to obtain the required stiffness: the first one consists in using a roller of wide diameter made from materials having a high coefficient of elasticity, as for example steel, and it provides only for two supports at the ends of said roller; the second one consists in using a roller of smaller diameter, and it provides for a series of lever supports along the whole length of the roller, so as to prevent any deformation thereof. Both these currently adopted solutions have however some drawbacks.

A warp yarn guiding roller of relatively wide diameter, made from materials such as steel, creates problems when having to be driven into an oscillating motion with high frequency, on account of its large mass. In fact, a large mass seriously reduces the intrinsic frequency of the oscillating system involving the warp yarn guiding roller, down to frequencies which are very close to the typical working frequencies of modern high-speed looms. To prevent any phenomena of resonance from possibly arising, it is thus necessary to increase the stiffness of the return springs of the warp yarn guiding roller; also this solution is not however fully satisfactory, in that the excessive stiffness of the oscillating system leads to an increase - with an equal oscillation amplitude of the guiding roller - of the tension on the warp yarns, causing it to reach levels such as to determine an undesired increase in the number of warp yarn breakages.

Another drawback of this type of warp yarn guiding rollers is tied to the high inertia thereof. In fact, since the motion of translation of the warp yarns is not continuous but intermittent, the synchronism between the movements of the warp yarns and the rotations of the underlying idle roller is often not perfect; in other words, a more or less heavy rubbing of the warp yarns against the surface of the guiding roller may take place, with consequent wear or crossing of said yarns, as well as possible tearing thereof.

The alternative of a thin and light warp yarn guiding roller, carried by a plurality of lever supports, is advantageous for what concerns the reduced mass of the oscillating system, but it causes inconveniences - actually due to the presence of the supports of the guiding roller and their hingeing axis - in the bundle of warp yarns sliding on said roller, giving rise to possible breakages and/or to an uneven distribution thereof and, furthermore, interfering with the work of the weaver when inserting new warp yarns, or repairing the same.

The present invention proposes to solve the aforementioned problems involving the known-type warp yarn guiding rollers, by providing a warp yarn guiding roller which is highly stiff and comprises only two lateral supports, said guiding roller having a limited mass, and thus a very high resonance frequency - far higher than the working frequencies even of high-speed looms - and a low inertia, so as to prevent any possible rubbing of the warp yarns onto the guiding roller.

According to the present invention, said objects are reached with an oscillating warp yarn guiding roller for looms, of the type supported at the ends by levers alternately oscillating in opposition to spring means, characterized in that it consists of a pair of aligned short metal shafts perpendicular to said levers to which they are fixed at their outer end, while their inner facing ends are reciprocally connected through a thin pipe coupling, and of a hollow cylinder of composite material freely rotating around the pair of short metal shafts, through bearings mounted onto said shafts.

Other characteristics and advantages of the warp yarn guiding roller according to the present invention will be described more in detail hereinafter, with reference to the accompanying drawings, in which:

Fig. 1 is a diagrammatic lateral view of a loom equipped with a warp yarn guiding roller according to the present invention; and
Fig. 2 is a longitudinal partial section view of the same roller.

To understand more clearly the arrangement and working of the warp yarn guiding roller, a brief description will now be given - with reference to fig. 1 - of the essential parts of a loom.

A plurality of warp yarns 2 are unwound from a beam 1 and their path is deviated by a guiding roller 3, along which they slide in order to reach the weaving zone, wherein they are selectively lifted or lowered by healds 4, to open the shed into which the weft yarns are inserted to form the fabric 5. Through a take-up roller 6 the cloth 5 is finally wound onto a cloth beam 7.

As shown in fig. 1, the alternate movement of the healds 4 allowing to form the shed, leads the warp yarns 2 to move in rapid succession through the positions marked P_1, P_2, P_3, with times and modes depending on the type of fabric being woven. The stretching undergone by the warp yarns 2 in the step leading them from position P_3 to position P_1 or P_2 and the shortening undergone by them in the reversed step, produce in the yarns 2 a change of tension T which is transmitted to the ends thereof. If both ends of the warp yarn stretch extending between the guiding roller 3 and the take-up roller 6 were to be blocked, the tension T would end by putting too much stress on said yarns and quickly lead to the breakage thereof. To prevent this drawback, as explained in the introductory part, one of the two ends of said stretch of warp yarns 2, and precisely the end in correspondence of the guiding roller 3, should follow the stretching movement - on opening of the shed - and the shortening movement - on closing of the shed - so as to keep the tension T reached by the warp yarns 2 substantially constant. This is obtained thanks to the fact that the warp yarn guiding roller 3, under the action imparted by the tension T on the yarns 2 and under the opposing action of return springs 8 - fixed at one end of levers 9, pivoting onto spindles 10 and the other end of which is fixed to the roller 3 - is apt to elastically oscillate about said spindles 10, thereby compensating for the length variations of the aforecited stretch of warp yarns 2. It is important to note, however, that the oscillation of the guiding roller 3 does not practically modify the length of the warp yarn stretch extending between the roller 3 and the warp beam 1, since this first stretch of warp yarns 2 is almost perpendicular to the direction of oscillation of the guiding roller 3.

The system comprising the warp yarn guiding roller 3, the levers 9, the springs 8, and the spindles 10, thus represents an oscillating system caused to oscillate by an external forcing action T having a frequency corresponding to the motion frequency of the healds 4.

In order to increase the intrinsic frequency of this oscillating system, while maintaining an appropriate stiffness of the warp yarn guiding roller, the Applicant - following a principle totally opposite to that taught by prior art - has conceived a hollow guiding roller of wide diameter and reduced mass, adopting a composite material of low specific weight. A warp yarn guiding roller, thus conceived, is actually less stiff than the conventional steel rollers but, as it has been possible to verify, it allows to perform a perfectly uniform weaving operation. In fact, thanks to its reduced mass, the warp yarn guiding roller according to the present invention can be equipped with return springs which are far less stiff than the ones normally adopted, which implies - in the end - less tension imparted on the warp yarns. The overall force thus applied by said warp yarns onto the warp beam is positively less strong than in the case of looms equipped with the conventional guiding rollers, and it can therefore be stood, without producing any harmful deformation, also by a hollow roller made from a composite material of reduced thickness, according to the present invention.

As shown in detail in fig. 2, the warp yarn guiding roller 3 of the present invention consists of a hollow cylinder 3a of composite material supported at each end, through bearings 11, by a respective shaft 3b fixed at one end of the levers 9, the other end of which is connected to the springs 8. The warp yarn guiding roller 3 is thus apt to freely rotate around said shafts.

The two shafts 3b are preferably made of steel - essentially for reasons of mechanical strength and for economic purposes, but they can also be of aluminium if allowed by the loads - and they are relatively short, having to simply act as supports for the bearings 11; they are hence not apt to significantly contribute to the whole mass of the guiding roller 3. A thin pipe coupling 12, made of steel or aluminium, is fixed onto the inner facing ends of the two support shafts 3b, so as to keep them reciprocally connected and in alignment.

The composite material used for producing the hollow cylinder 3a is preferably based on carbon fibres, having a wall thickness between 1 mm and 10 mm according to the length of the warp yarn guiding roller and to the type of fabric being woven. Said composite material is, among those currently available on the market, the one which provides the best ratio between specific weight and coefficient of elasticity; it is of course possible to use other suitable oriented composite materials by increasing the thickness in proportion to their reduced stiffness.

The aforedescribed structure of warp yarn guiding roller is apt to solve all the problems examined heretofore, in that it guarantees the required stiffness of the roller 3, even if the same should be very long (for example up to five meters), while maintaining an extremely reduced overall mass. This allows to obtain the required elasticity of the oscillating system, with springs 8 of reduced elastic constant, without thereby running into resonance phenomena. Furthermore, the reduced mass of the roller minimizes its moment of inertia, eliminating any possible friction and rubbing between the warp yarns and the surface of said roller.

Claims

1. Oscillating warp yarn guiding roller for looms, of the type supported at the ends by levers (9) alternately oscillating in opposition to spring means (8), characterized in that it consists of a pair of aligned short metal shafts (3b) perpendicular to said levers (9) to which they are fixed at their outer end, while their inner facing ends are reciprocally connected through a thin pipe coupling (12), and of a hollow cylinder (3a) of composite material freely rotating around the pair of short metal shafts (3b), through bearings (11) mounted onto said shafts (3b).

2. Warp yarn guiding roller as in claim 1), wherein said composite material of the hollow cylinder (3a) is based on carbon fibres.

3. Warp yarn guiding roller as in claim 1), wherein the wall thickness of said hollow cylinder (3a) is between 1 mm and 10 mm.

4. Warp yarn guiding roller as in claim 1), wherein said short metal shafts (3b) are of steel or aluminium.

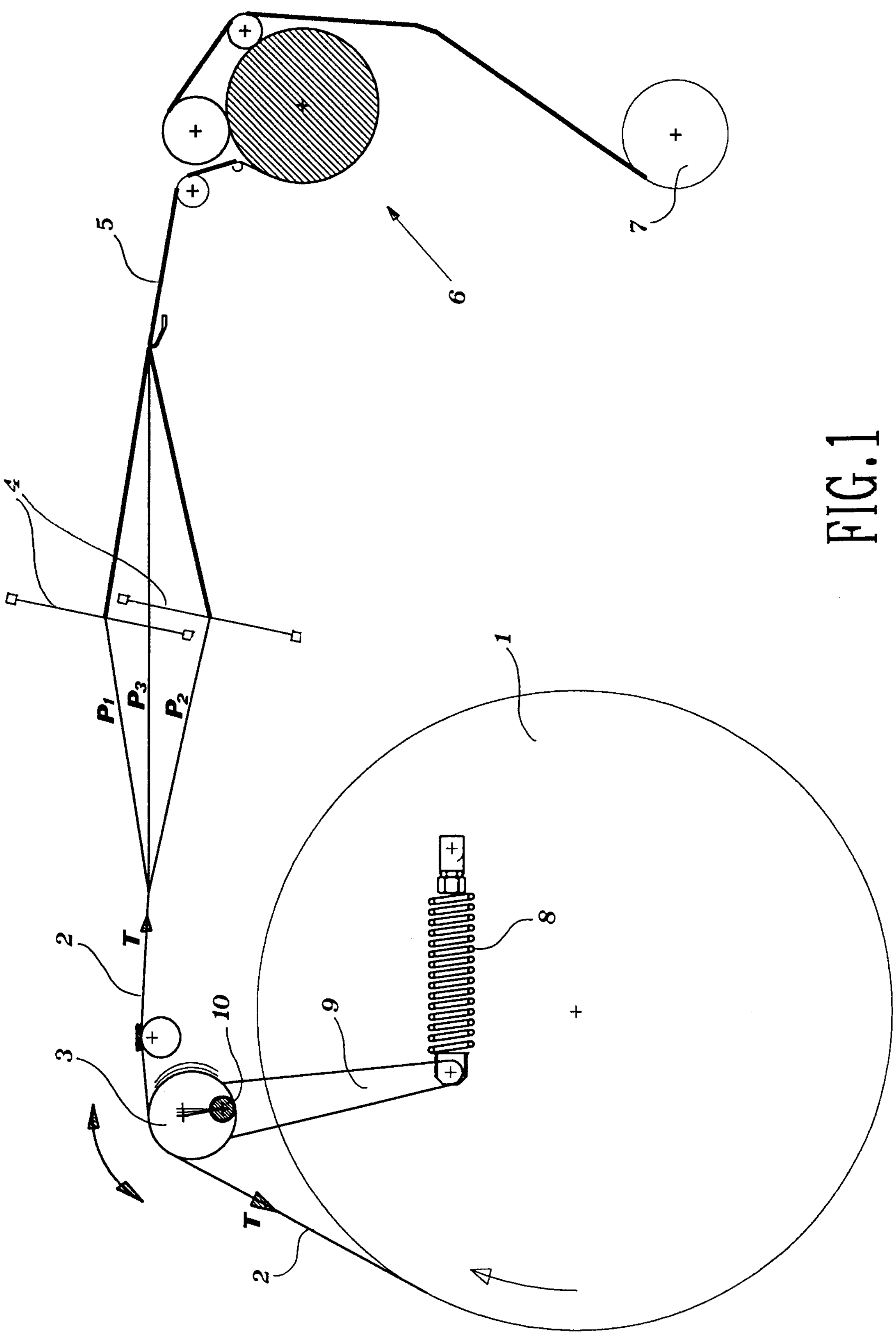

FIG.1

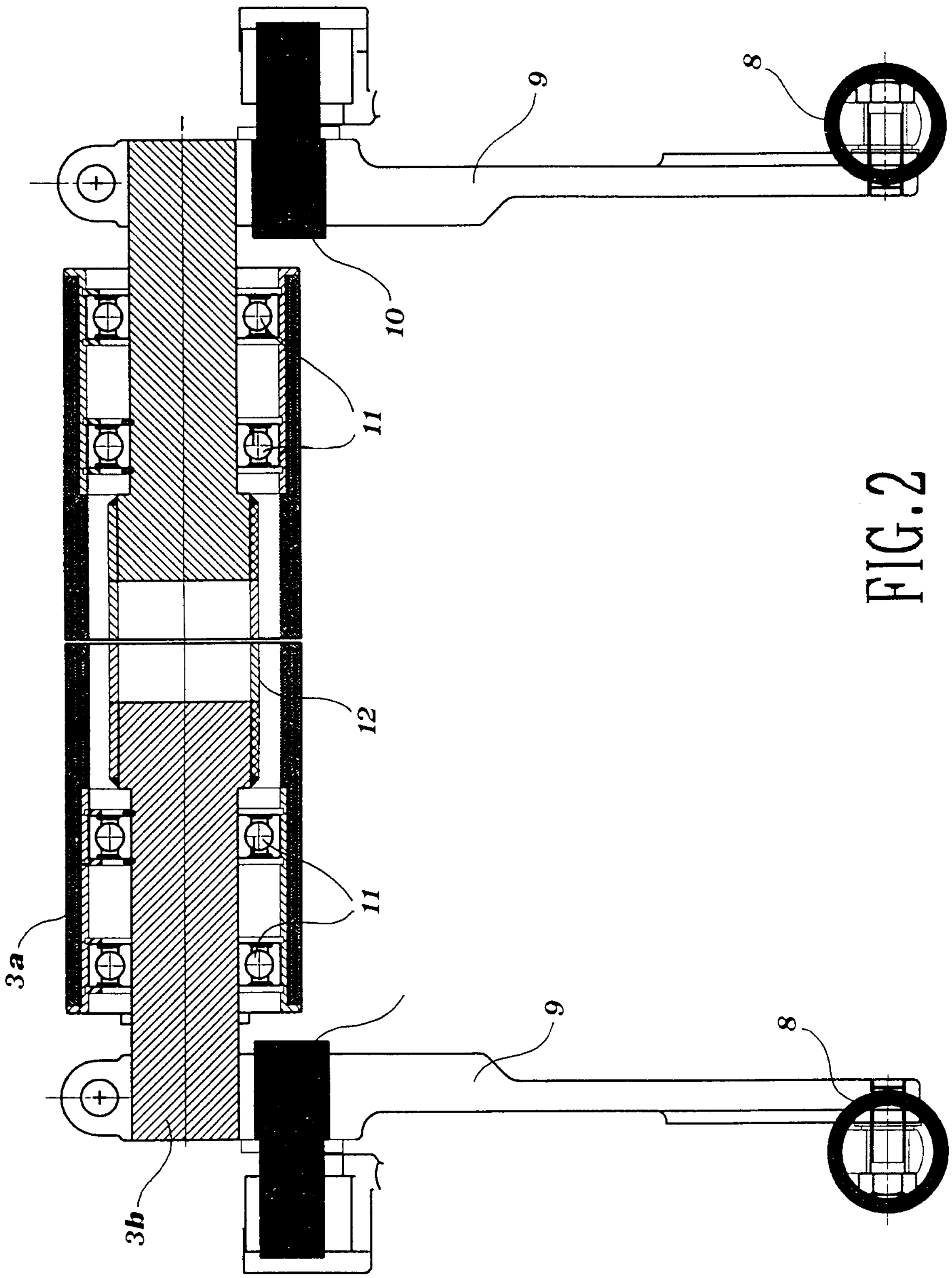

FIG.2

European Patent Office

EUROPEAN SEARCH REPORT

Application Number
EP 97 10 8493

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)
A	DE 33 46 030 A (INSTITUTE FÜR TEXTIL- UND FASERFORSCHUNG) * page 20, line 9 - line 20; figures 5,6 * ---	1	D03D49/22
A	FR 2 106 616 A (ELITEX) * page 2, line 17 - page 3, line 4; figures 1,2 * -----	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	8 August 1997	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)