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(54) **CONTROL LEVERAGE MECHANISM OF A TUCK-IN DEVICE FOR WEAVING MACHINES
HAVING A TRAVELLING WORKING HEAD**

(57) A control leverage mechanism of a travelling-head (T) tuck-in device for a weaving loom characterized in that it comprises a first articulated quadrilateral (Q1), whose end hinges (1, 2) are fixed to the loom, which takes the alternate movement from the loom sley (S) and transfers said alternate movement, suitably modulated, to a terminal lever (L2) hinged to one of said end hinges (2), said terminal lever (L2) integrally carrying said travelling-head (T) of the tuck-in device.

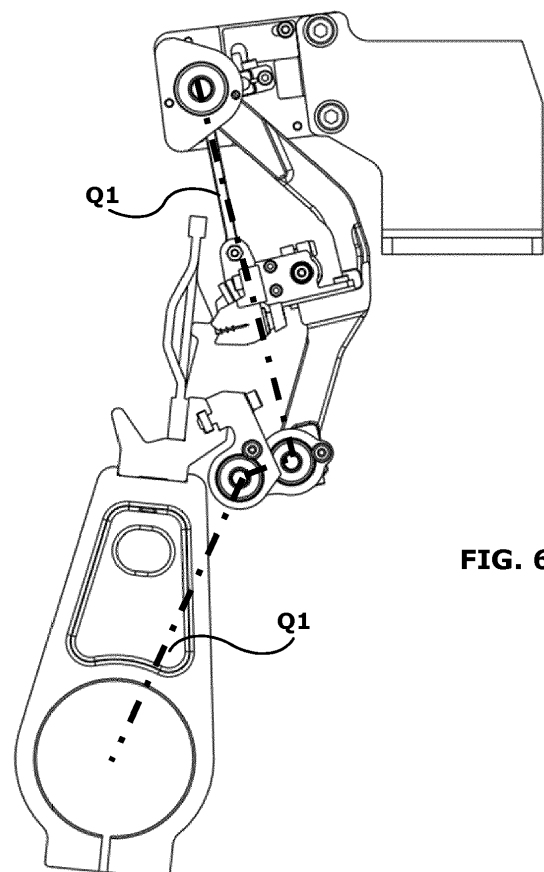


FIG. 6

Description

[0001] The present invention relates to a control leverage mechanism for tuck-in devices for weaving machines and, in particular, for tuck-in devices whose working head is alternately movable in the direction of the warp, during each weft insertion cycle.

FIELD OF THE INVENTION

[0002] Devices for selvage formation, briefly named in the field as "tuck-in devices", consist of mechanical, electrical, pneumatic devices, or combinations thereof, which are used in shuttle-less looms to form a false selvage (so defined in contrast to the actual selvage that is formed in shuttle looms) along the lateral edge of the fabric being weaved, securely fixing the weft-ends projecting laterally from the piece of fabric after the insertion and cutting operations of the weft threads.

[0003] This operation is achieved by means of a tuck-in device working head which, with various possible mechanical, electronic, pneumatic, or mixed operating modes, grabs the free weft-end of the last inserted weft, immediately after the shed closure and the reed beating-up on that weft, and reinserts it immediately in the shed, thus anticipating both the shed closure and the reed beating-up on the next weft, so that the weft-end itself is held permanently in position between the warp yarns along with said subsequent weft, thus allowing the formation of the selvage, as an alternative to the free fringe of weft-ends, with considerable advantages in terms of stability and strength of the edges of the fabric during subsequent fabric processing and manipulations.

[0004] Tuck-in devices are more frequently equipped with a fixed working head and are positioned on both sides of the piece of fabric that is machined alongside the reed. Since often one or more pieces having a reduced width are woven at the same time on the full width of the loom, in order to allow the positioning of the tuck-in device with a fixed working head inside the loom shed, it is obviously necessary to shorten or cut the reed in two or more parts, otherwise there would be a mechanical interference between the reed and the tuck-in device during the movement of the reed.

[0005] The tuck-in devices provided with a travelling working head - in the following also briefly named as "travelling-head tuck-in devices" - solve this problem thanks to the fact that their travelling-head is provided with an alternating movement in the direction of the warp yarns, which allows the backward movement of said working head during the reed beating-up step and the subsequent quick forward movement of the same in the immediately following step. It is therefore possible to operate these tuck-in devices with an entire reed, i.e. a reed extending over the whole width of the loom regardless of the size and the number of pieces of fabric simultaneously worked on the loom.

STATE OF THE PRIOR ART

[0006] Fixed-head tuck-in devices having different structures and driving systems are disclosed, for example, in EP 0286443, US 4905740 and US 2006/0207676.

[0007] Well-known in the field is then a travelling-head tuck-in device made by SULTEX AG, which does not appear to have been patented, wherein the movement of the working head of the tuck-in device, movable on linear sliding guides, was derived from the main movement of the loom (and in particular from the movement of the sley) by means of a linkage comprising an articulated quadrilateral and a cam. Said cam was suitable to cause the desired law of motion of the tuck-in device travelling-head.

[0008] The travelling-head of the tuck-in device disclosed in the aforementioned patent was then made integral, according to a previously-known arrangement, to a weft cut-off device, so that it would follow the head of the tuck-in device in its alternating motion in the longitudinal direction, so as to perform weft cutting at the selected time, after weft insertion in the shed. The control of said cutting device was independent of the control of the travelling-head of the tuck-in device and was normally performed by a pneumatic or electrical device.

[0009] Finally, EP-2176455 discloses a method for forming a selvage, wherein the travelling tuck-in device is integrally fixed to the reed and thus moves in synchronism with the same. Although this solution is of simple and compact construction, it has a major disadvantage because it offers a too short permanence time of the tuck-in device in the useful area for picking the weft-end and reintroducing it into the shed. This operation cannot therefore be performed correctly, and selvage formation is irregular.

BRIEF DESCRIPTION OF THE INVENTION

[0010] The technical solution disclosed by the Sultex travelling-head tuck-in device, briefly described above, is still the one which offers the best textile results, i.e. allows the formation of an excellent-quality selvage, but has some mechanical drawbacks that the present invention intends to overcome.

[0011] A first critical point of the control of the travelling-head of the above shown tuck-in device lies in the linear guides on which the travelling-head of the tuck-in device slides. These guides are in fact delicate components that generally require a lubrication system or, at least, regular greasing operations to provide a regular performance and a satisfactory life span, in order to prevent wear from appearing too quickly, as well as to avoid the formation of clearances which reduce the reliability of the device.

[0012] A second critical point can be seen in the cam system per se, and is related to the need to provide proper lubrication, or at least a regular greasing of the cam followers. Moreover, such cam followers pose serious reliability issues in this kind of applications.

[0013] A third drawback is finally connected to the necessary arrangement of a separate control for the weft cutter. In fact, pneumatic cutting devices have delayed response issues which complicate their handling. Electric-type servocontrols, which have a completely satisfactory functionality, still have high costs and are demanding from the hardware and software implementation point of view.

[0014] Accordingly, a first object of the present invention is to provide a travelling-head tuck-in device provided with a newly conceived control which does not require the use of cylindrical guides to obtain the alternate translational movement of the travelling-head.

[0015] A second object of the present invention is the elimination of a system involving the use of any cam system to generate the alternate motion of the travelling-head.

[0016] A further additional object of the present invention is finally to provide a tuck-in device wherein the weft cutting operation can be performed without the use of pneumatic or electric actuators, to achieve a simpler and more cost-effective construction.

[0017] All of these objects are achieved, according to the present invention, by means of a control leverage mechanism of a travelling-head tuck-in device for weaving looms having the features defined in claim 1. Other preferred features of this control leverage mechanism of a travelling-head tuck-in device are defined in the secondary claims.

BRIEF DESCRIPTION OF THE DRAWINGS

[0018] Further features and advantages of the control leverage mechanism of a tuck-in device according to the present invention will anyhow become more evident from the following detailed description of a preferred embodiment of the same, given by mere way of non-limiting example and illustrated in the accompanying drawings, wherein:

Fig. 1 is a schematic perspective view of the leverage mechanism of the invention, seen from the right side of the loom;

Fig. 2 is a schematic perspective view of the leverage mechanism of Fig. 1, seen from the left side of the loom;

Fig. 3 is a schematic front elevational view, from the right side of the loom, of the leverage mechanism of the invention and of the loom sley from which said leverage mechanism takes its movement, when the sley - and the reed fixed thereto - is in the weft beating-up position and the travelling-head of the tuck-in device is therefore in a fully advanced position;

Fig. 4 is a view similar to Fig. 3 with the sley and the travelling-head of the tuck-in device in a fully retracted position, to bring said travelling-head in alignment with the newly introduced weft; and

Figs. 5 and 6 are views respectively similar to Figs.

4 and 3, from the left side of the loom.

DETAILED DESCRIPTION OF PREFERRED EMBODIMENTS

[0019] In the following description, the terms "forward" and "advancement" are always intended as referring to the advancement direction of the fabric on the loom, corresponding to the beating-up movement of the reed. The terms "back" and "backward" obviously refer to the opposite direction. The right and left side of the loom are referred to the position normally occupied by the weaver, i.e. facing the loom from the side of the same from which the fabric being weaved comes out.

[0020] In a first embodiment, the control leverage mechanism of a tuck-in device according to the present invention, in order to achieve the above highlighted first and second objects, comprises a first articulated quadrilateral Q1, whose end hinges 1 and 2 (Fig. 5) are integral to the loom and which takes the alternate movement from the sley S of the loom. In fact, the same sley S forms the first lever of the articulated quadrilateral Q1, which then comprises a short forward-transmission connecting rod L1 and a long terminal lever L2, hinged on the end hinge 2, integral with the body of the tuck-in device C. The articulated quadrilateral Q1 therefore comprises said two hinges 1, 2 fixed with respect to the loom, and two movable hinges 3, 4 connecting the connecting rod L1 respectively to the sley S, through a fork support 5, and to the terminal lever L2. The fork support 5, in a per-se known manner, is slidable on a guiding rail integral with the sley S and can be secured in any desired position along the same.

[0021] According to the main feature of the present invention, the travelling-head T of the tuck-in device is integral with the lever L2, at an approximately central position of the same. The first articulated quadrilateral Q1 has therefore the function of taking the movement from the sley S to generate the rotation of the lever L2 on the hinge 2 through the connecting rod L1 and, consequently, the alternate movement of the travelling-head T. Such movement of the tuck-in device occurs therefore along a circle arc having its centre in the hinge 2.

[0022] Due to space reasons, the lever L2 extends towards the upper part of the loom, so as to make it easier and quicker to position the tuck-in device on the respective guiding rails, one of which is fixed in relation to the loom, while the other is integral with the sley S. This arrangement is not, however, necessary; in view of the existing spaces in the loom, the terminal lever L2 could thus also develop in other directions. As mentioned above, the lever L2 has a considerable length; preferably this length is equal to or greater than the length of the lever formed by the sley S, and precisely that portion of the sley between the hinge 1 and the hinge 3. Due to this reason, the movement of the travelling-head of the tuck-in device T takes place along a circle arc wide enough to form a satisfactory approximation of the rectilinear mo-

tion typical of the known guided travelling-head tuck-in devices. Therefore, the above described leverage mechanism so replaces the cylindrical guides of such known devices, with obvious simplification and a drastic reduction of maintenance interventions.

[0023] All the hinges 2, 3 and 4 of the leverage mechanism preferably comprise double bearings to allow for an easy centring of the lever mechanism when positioning the tuck-in device on the loom and also a clearance-free movement of the lever L2 which carries the travelling-head T during the operation of the loom.

[0024] Thanks to the above shown arrangement, the stroke of the travelling-head T of the tuck-in device has a much smaller length than that of the reed P fixed on the top of the sley, depending on the different distance of these two devices from the respective rotation centres. By carefully designing the length of the connecting rod L1, the length and shape of the terminal lever L2 and the position on the same of the travelling-head of the tuck-in device, it is thus possible to obtain a forward movement of the travelling-head T during the reed beating-up (Figs. 3 and 6) sufficient to avoid any interference with the reed, while during the backward movement of the sley S the travelling-head T performs a much more limited run of the reed P (Figs. 4 and 5), thus staying for a longer time in the useful area for the formation of the selvage, i.e. at the insertion point of the weft. Further, the arrangement of the levers L1 and L2 is such that said levers, or more precisely the segments connecting the respective rotation centres, are approximately perpendicular to each other, when the reed P is beating-up the weft, so that at the beginning of the backward movement of the reed P the travelling-head T has its maximum speed, and then slows down when it approaches the area where the tuck-in can be effectively performed.

[0025] Thanks to the operation of the articulated quadrilateral Q1, the movement of the sley S is transferred to the travelling-head T in a suitably modulated manner, and precisely with a reduced movement length, with a reduced average speed and with a relative stay time in the tucking-in working area longer than the approaching and displacement time of the travelling-head T with respect to said area.

[0026] In the first embodiment of the control lever mechanism of the present invention, as described above, the cutting of the weft is performed by means of an electrical servocontrol M, integral with the body C of the tuck-in device, which operates a lever 6 controlling the cutting device adjacent to the travelling-head T of the tuck-in device.

[0027] In a second embodiment of the control lever mechanism of the present invention, not shown in the drawings, the electrical servocontrol M is absent and the operation of the cutting device is instead operated by a second articulated quadrilateral, which takes movement from the lever L2 of the first articulated quadrilateral, similarly to what is disclosed in patent application EP-3073003 on behalf of the same Applicant, which content

is herewith enclosed by reference. Thus, the third object of the present invention can also be achieved.

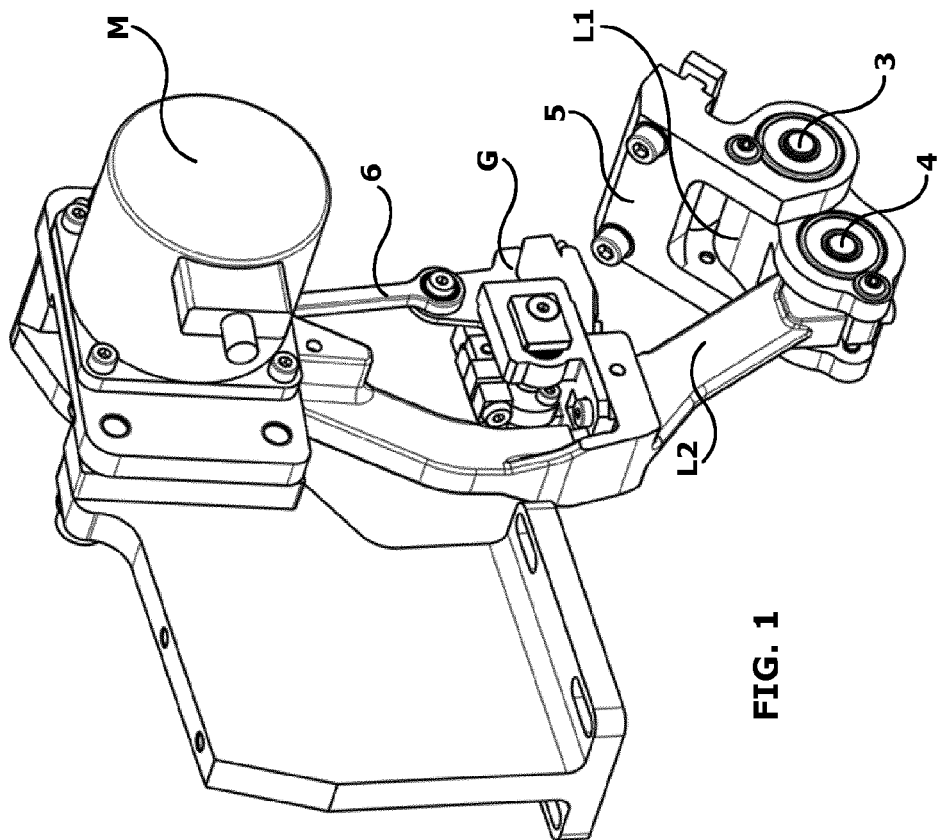
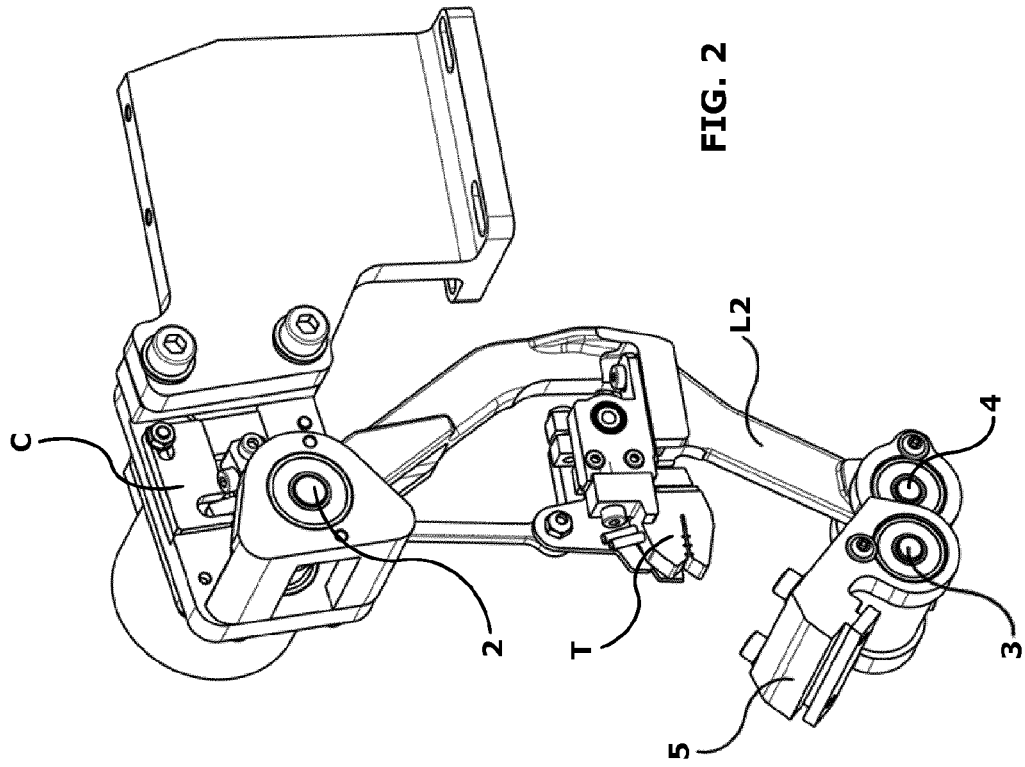
[0028] It is understood, however, that the invention is not to be considered as limited by the particular arrangements illustrated above, which represent only exemplary implementations of the same, but different variants are possible, all within the reach of a person skilled in the art, without departing from the scope of the invention itself, which is exclusively defined by the following claims.

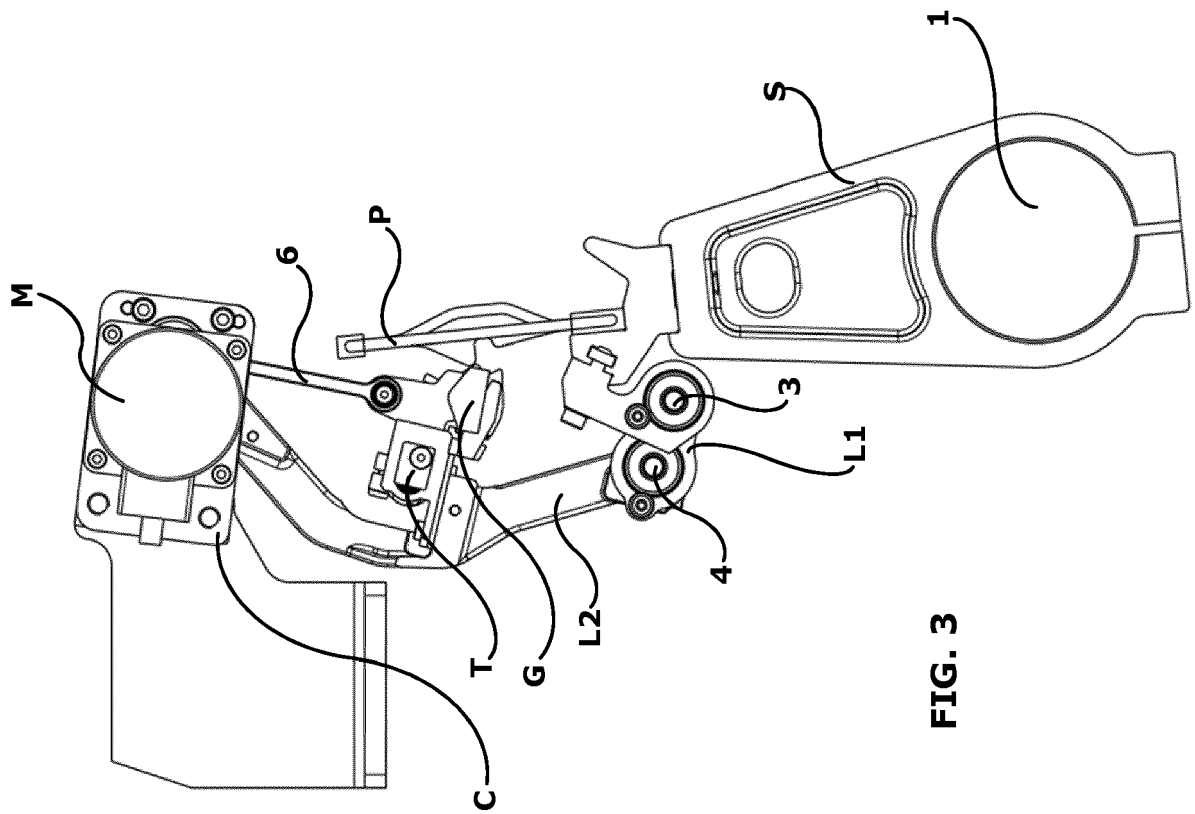
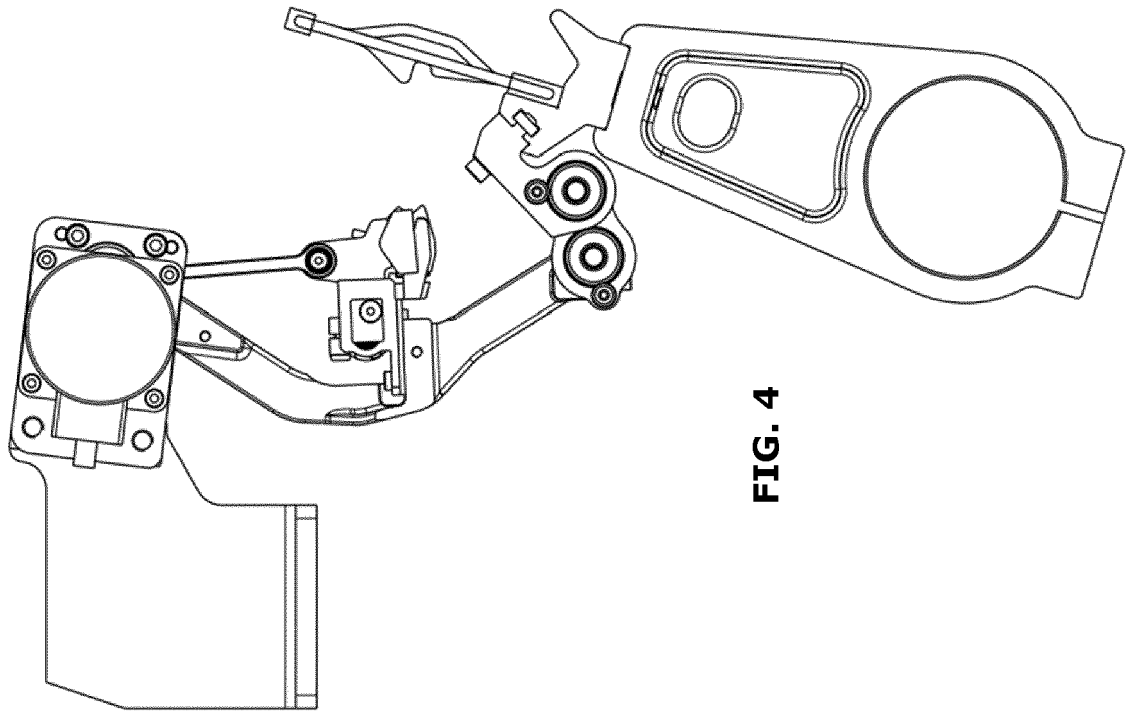
Claims

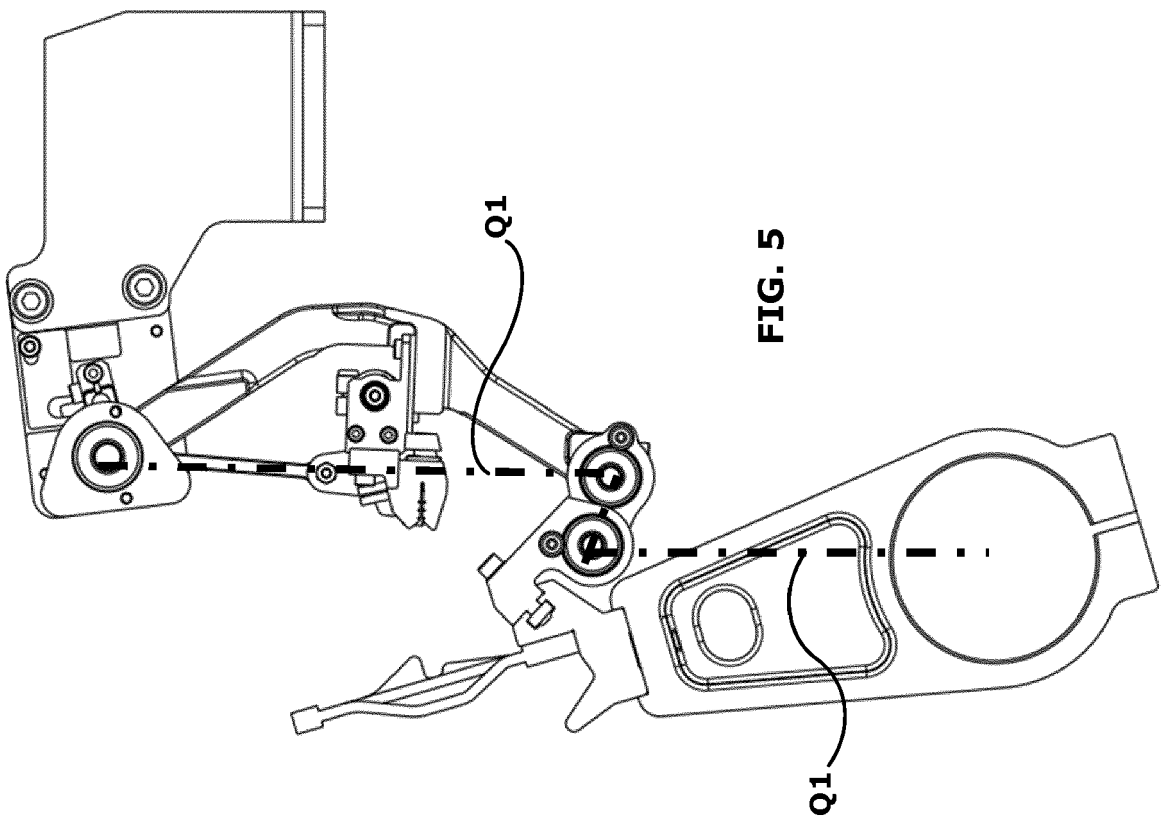
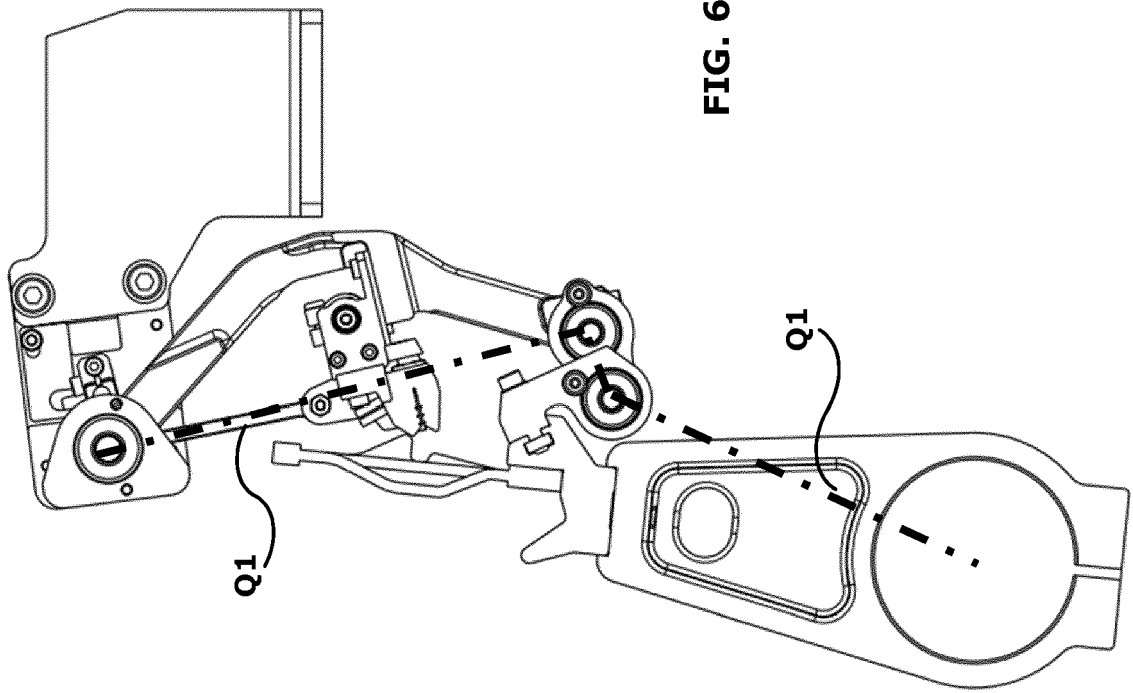
1. Control leverage mechanism of a travelling-head (T) tuck-in device for a weaving loom **characterized in that** it comprises an articulated linkage (5, L1, L2) connecting a fixed point (2) of the loom and the loom sley (S), the travelling-head (T) of said tuck-in device being integrally carried by an element of said linkage (5, L1, L2).
2. Control leverage mechanism of a travelling-head (T) tuck-in device for a weaving loom as in claim 1, wherein said linkage comprises a first articulated quadrilateral (Q1), whose end hinges (1, 2) are fixed to the loom, which takes the alternate movement from the loom sley (S) and transfers said alternate movement, suitably modulated, to a terminal lever (L2) hinged to one of said end hinges (2), said terminal lever (L2) integrally carrying said travelling-head (T) of the tuck-in device.
3. Control leverage mechanism of a tuck-in device according to claim 2, wherein said articulated quadrilateral (Q1) includes said sley (S), a forward-transmission connecting rod (L1) and said terminal lever (L2).
4. Control leverage mechanism of a tuck-in device according to claim 3, wherein said forward-transmission connecting rod (L1) is hinged by means of two moving hinges (3, 4) respectively to the sley (S) and to the terminal lever (L2).
5. Control leverage mechanism of a tuck-in device according to claim 4, wherein said forward-transmission connecting rod (L1) has a small length and is hinged by means of said moving hinge (3) on a fork support (5) which can be fixed in an adjustable position along a guiding rail integral to the sley (S).
6. Control leverage mechanism of a tuck-in device according to claim 5, wherein said terminal lever (L2) has a length equal to or greater than the distance between the fixed hinge (1) of the sley (S) and the moving hinge (3) integral to said sley (S).
7. Control leverage mechanism of a tuck-in device ac-

according to claim 6, wherein said forward-transmission connecting rod (L1) and said terminal lever (L2) or, more specifically, the segments connecting the respective rotation centres of said levers, are approximately mutually perpendicular, at the reed (P) beating-up.

8. Control leverage mechanism of a tuck-in device according to claim 6, wherein the fixed hinge (2) of the terminal lever (L2) is arranged above the moving hinge (4) connecting said lever (L2) to the forward-transmission connecting rod (L1).
9. Control leverage mechanism of a tuck-in device according to any of the preceding claims, further comprising an electrical servocontrol (M), integral to the fixed body (C) of the tuck-in device, for the operation of a cutting device integral to the travelling-head (T) of the tuck-in device.
10. Control leverage mechanism of a tuck-in device according to any of the preceding claims, further comprising a second articulated quadrilateral, taking its movement from said first articulated quadrilateral (Q1), and controlling the operation of said cutting device integral to the travelling-head (T) of the tuck-in device.
11. Control leverage mechanism of a tuck-in device according to any of the preceding claims, wherein the hinges on which said terminal lever (L2) and said forward-transmission connecting rod (L1) are pivoted, comprise double bearings









EUROPEAN SEARCH REPORT

Application Number
EP 17 20 4305

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DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X,D	EP 3 073 003 A1 (ITEMA S P A [IT]) 28 September 2016 (2016-09-28)	1	INV. D03D47/48
A	* paragraph [0004] - paragraph [0008] * * paragraph [0019] - paragraph [0042] * * figures 1-4 *	2-11	
A	----- DE 44 43 899 C1 (DORNIER GMBH LINDAUER [DE]) 23 November 1995 (1995-11-23) * column 1, line 5 - column 2, line 2 * * column 3, line 1 - column 4, line 14 * * figures 1-4 *	1-11	
A	----- EP 0 122 087 A1 (DRAPER CORP [US]) 17 October 1984 (1984-10-17) * page 3, line 15 - page 6, line 26 * * figures 1-3 *	1-11	
			TECHNICAL FIELDS SEARCHED (IPC)
			D03D
The present search report has been drawn up for all claims			
Place of search Munich		Date of completion of the search 24 April 2018	Examiner Hausding, Jan
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			

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**ANNEX TO THE EUROPEAN SEARCH REPORT
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EP 17 20 4305

5 This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.
The members are as contained in the European Patent Office EDP file on
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24-04-2018

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- EP 3073003 A [0027]