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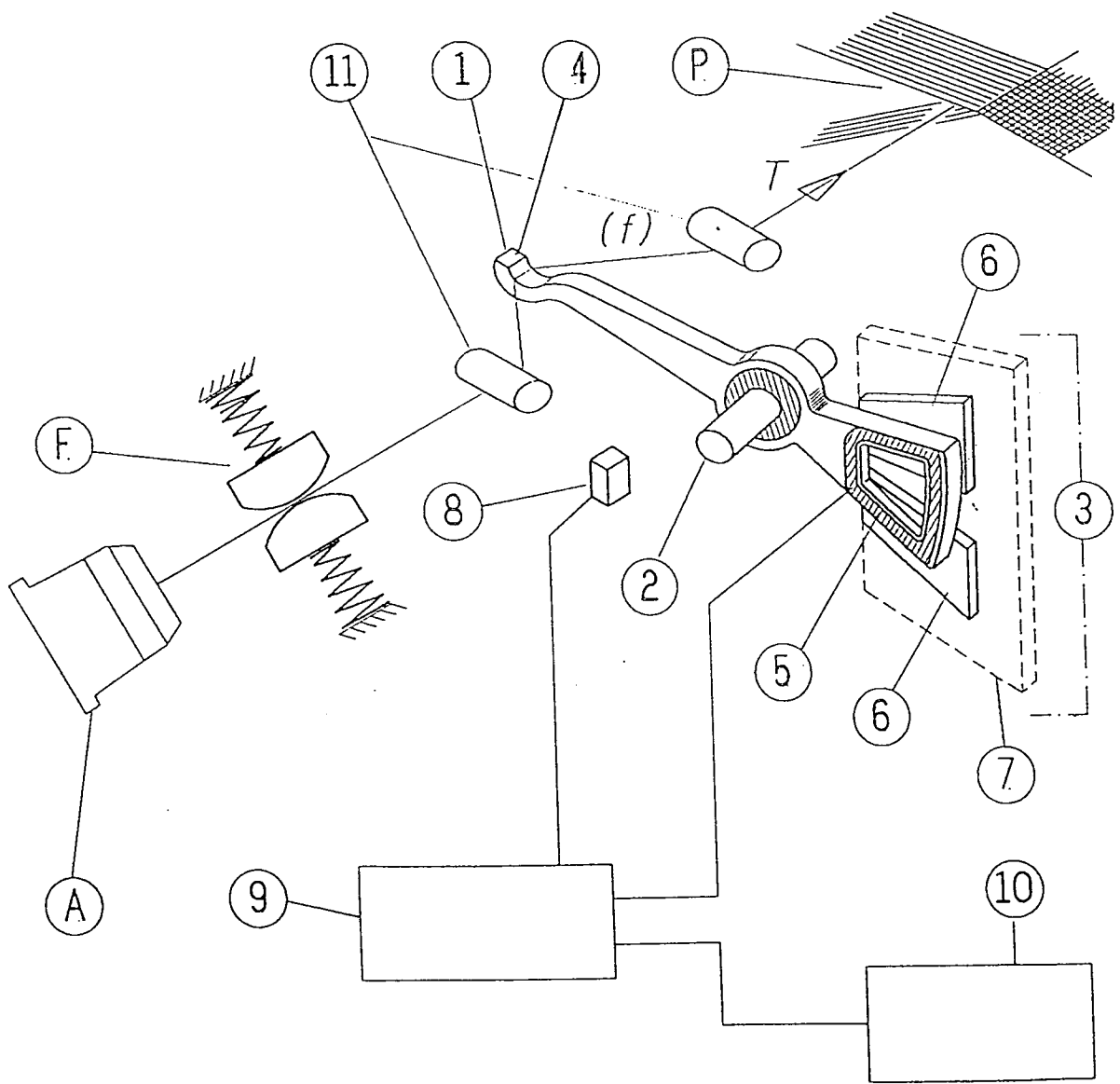
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(54) Device to regulate weft yarn tension and recover the weft yarn in looms.

(57) A device to regulate weft yarn tension and recover the weft yarn in looms comprises an oscillating lever (1) having a yarn guide (4) at the end which, in the lever rest position, is interposed between two fixed yarn guides (11). According to the invention, the strokes of said lever are controlled by a linear electric motor (3), running under the control of an electronic system associated to the electronic system (9,10) which controls the loom and to a sensor (8) constantly detecting the position of said lever.



It is known that, in looms, the weft yarns are inserted by suitable transport means into the sequence of warp yarns forming the shed. The weft yarns are then pressed together by a reed during beating up.

The succession of weft insertions, beatings up, and exchanged positions of warp yarns, determines the formation of the wanted fabric. The need hence arises to insert into the warp shed a certain sequence of different weft yarns.

The known systems for weft insertion into the shed are, in shuttleless looms, the projectile, the gripper, the water and the air system.

All these systems require - for a regular and productive working of the loom - the tension of each weft yarn to be varied to a suitable and optimal extent during its transport in the warp shed.

When insertion takes place, the weft yarn is unwound from reels or drawn from weft feeders, and is inserted into the shed with a motion law varying according to the system adopted. As the yarn end undergoes an acceleration, said yarn is subjected - on account of its mass and of the frictions involved - to an increasing tension, whereas the deceleration of the yarn end reduces weft yarn tension. Said tension could thus even drop to zero, causing quite a lot of weaving problems and spoiling the quality of the fabric.

To prevent this drawback, weft yarn braking devices have since long been used in technique, said devices being apt to increase yarn tension by producing a friction thereon as it moves along. For instance, use is made of two braking elements pressed one against the other by elastic means, the weft yarn to be braked sliding between said elements. In this case, to adjust the braking action, the elastic coupling pressure is varied either manually, by an operator, and/or by mechanical or electromagnetic devices.

It is equally known to make use on looms of devices to recover the weft yarn, namely devices apt to suitably move the weft yarn in the direction opposite to that of weft insertion. Said devices generally comprise an oscillating lever controlled by kinematic mechanisms, by cams or by springs, having at the end a yarn guide whose axis, in the rest position, is aligned with that of two fixed yarn guides positioned to the sides thereof. The yarn slides in a straight line through said yarn guide. When the weft yarn has to be recovered, namely, called back from the direction of insertion, the lever oscillates moving its yarn guide out of alignment from the fixed yarn guides, and hence pulling back the weft yarn on the side where there is less braking resistance, namely from the warp shed, since on the side of the reel or of the weft feeder there acts a braking device.

Systems of this type have the drawback of the levers performing the same stroke for each operation. An operator is hence required to vary said stroke. Such systems show moreover the inconvenience of not res-

ponding to yarn tension while it is being recovered. In fact, during yarn recovery, the following anomalous situations can arise:

- The yarn is stopped or braked for accidental causes and the recovery movement can produce a tension increase which may exceed the limit of resistance and cause yarn breakage.
- If the yarn length to be recovered is longer than that foreseen, the recovery movement can be insufficient to reestablish a correct or sufficient yarn tension.
- In air looms, the weft is inserted by means of air jets and the yarn length to be inserted is predetermined by the weft feeder positioned between the yarn feeding reel and the main nozzle of the loom. At the end of insertion, when a predetermined yarn length has been inserted, a pin in the weft feeder stops the yarn, which is thus subjected to a pulling action and to vibrations having to be damped.

The present invention now proposes a device which is apt to perform both the function of yarn tension regulator and that of yarn recovery, and wherein the lever stroke can be varied while the loom is working, as said device is suitably controlled by an electronic system.

Such a device - of the type comprising at least one oscillating lever having a yarn guide at the end which, in the lever rest position, is interposed between two fixed yarn guides - is characterized in that the lever strokes are controlled by a linear electric motor, running under the control of an electronic system associated to the electronic system which controls the loom and to a sensor constantly detecting the position of said lever.

The invention is now described in further detail, by mere way of example, with reference to a preferred embodiment thereof, diagrammatically illustrated on the accompanying drawing which shows a perspective view thereof.

The device according to the invention, applied between a weft feeder A with brake means F and the warp shed P of a loom, comprises a lever 1 (more levers could however be provided) pivoted on a pin 2 and rotating about said pin under the control of a linear electric motor 3. The lever 1 carries at one end a yarn guide 4 and at the other end a bobbin 5 (more bobbins could however be provided) forming the linear motor 3. Said motor also comprises two permanent magnets 6, supported by a ferromagnetic plate 7, which generate a magnetic field into which is immersed the bobbin 5.

The lever 1 oscillates rotating about the pin 2 and its position is constantly detected by sensors 8.

An electronic control system, diagrammatically indicated by 9, detects in fact the position of the lever 1 through the position sensor 8 and - taking into account the signals issued by the microprocessor 10

equipping the loom on which the device of the invention is mounted - suitably feeds the bobbin 5 of the linear electric motor 3.

When the device of the invention works as weft yarn tension regulator, the linear motor 3 is fed by the control system 9 so that the force transmitted to the lever 1 by the bobbin 5 is apt to balance the force imparted by the yarn f on said lever 1 in correspondence of the yarn guide 4, which force tends to shift said lever from the position established by the control system 9 and detected by the position sensor 8.

In fact, in static conditions, i.e. in presence of inertial forces, the force acting on the yarn guide 4 is proportional to the resultant of the tension of the yarn f.

The force in correspondence of the bobbin 5 increases almost linearly with the electric feed current going through the same, and it is thus possible to calculate the tension of the yarn f by knowing the feed current required to balance the lever 1.

The system 9 thus compares the tension of the yarn f, through the various points of the loom working cycle, with the values or with the allowable interval of values memorized for that type of weft, and it operates - if required - so as to vary the tension of the weft yarn and regulate it (in the sense of reducing it if it exceeds the preset value, or viceversa).

The tension increase is obtained by lifting the yarn guide 4 in respect of the two fixed yarn guides 11; when in alignment with said yarn guides, the yarn guide 4 of the lever 1 takes up the rest position of the device. In fact, weft yarn tension T downstream of the device increases on increasing of the yarn winding angles around the yarn guides 11.

The device to regulate weft yarn tension, according to the invention, can be timed with the device to open the warp shed, by connecting the microprocessor 10 of the loom with the control system 9, so as to increase weft yarn braking at the outlet of the gripper - and make up for the scarce braking thereof by the warp yarns of certain weaves - thereby favouring weft release from the gripper at the outlet of the warp shed and hence reducing yarn wastes.

In gripper looms, the device according to the invention can be mounted both upstream (a device for each weft yarn) of the weft presenting device, and downstream thereof (only one device).

In air looms, the device according to the invention is mounted upstream of the main nozzle; it increases weft braking in the final part of yarn insertion. The increase in weft braking limits its speed at the end of insertion, thereby reducing weft impact against the stop pin of the measuring weft feeder (and thus the vibrations produced by impact).

If the system is not apt to keep, when operating, the tension variations within the preset range, it signals the defect to the operator by way of a diagnostic program.

The system can also work, independently from

weft yarn tension, simply as a programmable yarn recovery device.

It is in fact possible - during the loom working cycle - to program a series of strokes of the lever 1, with different shifting times and movements, in order to recover or possibly align the yarn in any particular points. It is for instance possible to program yarn recovery during weft exchange between the grippers at the centre of the shed, or at the end of insertion, so as to limit weft wastes and long tails.

It is understood that there may be other embodiments and methods to apply the device of the invention, falling within the scope thereof.

Claims

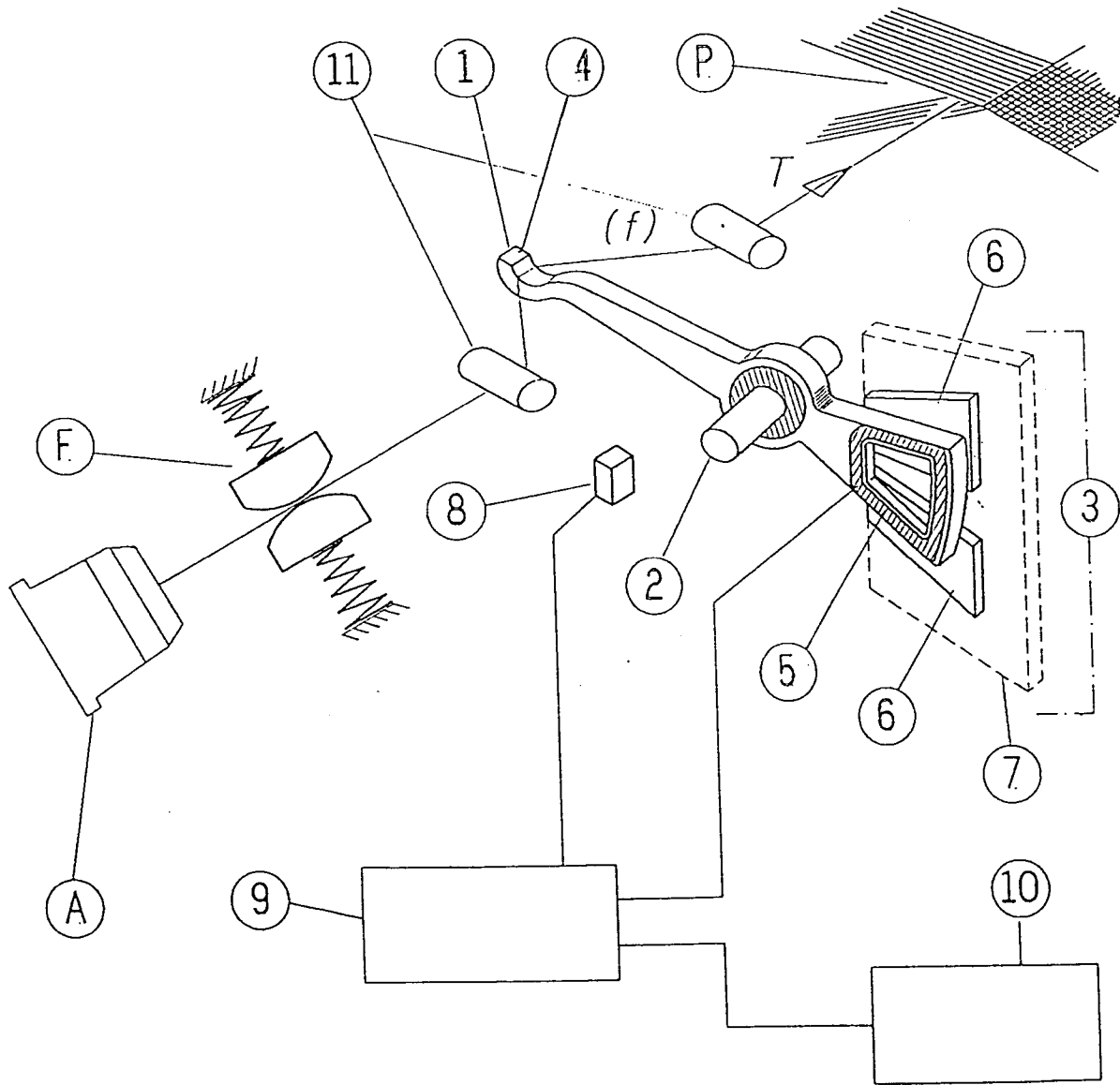
1) Device to regulate weft yarn tension and to recover the weft yarn in looms - of the type comprising at least one oscillating lever having a yarn guide at the end which, in the lever rest position, is interposed between two fixed yarn guides - characterized in that the lever strokes are controlled by a linear electric motor, running under the control of an electronic system associated to the electronic system which controls the loom and to a sensor constantly detecting the position of said lever.

2) Device as in claim 1), wherein said system controlling the linear electric motor is apt to govern said motor so as to obtain shiftings of said lever which can be varied and programmed, during the loom working cycle, independently from the tension of the weft yarn being fed to the loom.

3) Device as in claims 1) and 2), wherein said electronic systems comprise a microprocessor.

4) Device as in claims 1) to 3), apt to signal any differences between the preset values of weft yarn tension and those detected during weft insertion, and to vary the loom working parameters so as to keep within the preset tension values.

5) Device as in claim 1), apt to regulate weft yarn tension also during yarn recovery.





European Patent
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EUROPEAN SEARCH REPORT

Application Number

EP 91 10 9117

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	EP-A-0 356 380 (SULZER) * column 5, line 45 - line 47 *	1	D03D47/34
A	DE-C-3 803 146 (JAEGER) * the whole document *	1	
A	EP-A-0 357 975 (VAMATEX) * the whole document *	1	
			TECHNICAL FIELDS SEARCHED (Int. Cl.5)
			D03D
The present search report has been drawn up for all claims			
Place of search THE HAGUE		Date of completion of the search 28 OCTOBER 1991	Examiner VUILLEMIN L. 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			

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