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(71) Applicant: **Smit S.p.A. - Unipersonale**
36015 SCHIO (Vicenza) (IT)

(72) Inventors:
• **Bonollo, Fabio**
36036 Torrebelticino (Vicenza) (IT)
• **Perrone, Vittorio**
36034 Malo (Vicenza) (IT)
• **Pezzin, Stefano**
36015 Schio (Vicenza) (IT)

(74) Representative: **Coppo, Alessandro et al**
Ing. Barzanò & Zanardo Milano S.p.A.,
Via Borgonuovo, 10
20121 Milano (IT)

(54) **Angular servo-motor for the controlled positioning of elements connected to weft or warp yarns in a weaving machine**

(57) An angular servo-motor for the controlled positioning of elements connected to weft or warp yarns, in a weaving machine, essentially comprising a position control angular motor, with direct current sent to a "brush-less" rotor (1), the latter connected to a sequence of elements consisting of cables (5) and small heddle-carrier looms (10, 11); the servo-motor in question is capable of conferring an alternating motion to the aforesaid small heddle-carrier looms (10, 11), such to obtain the desired weaves between the weft and warp yarns.

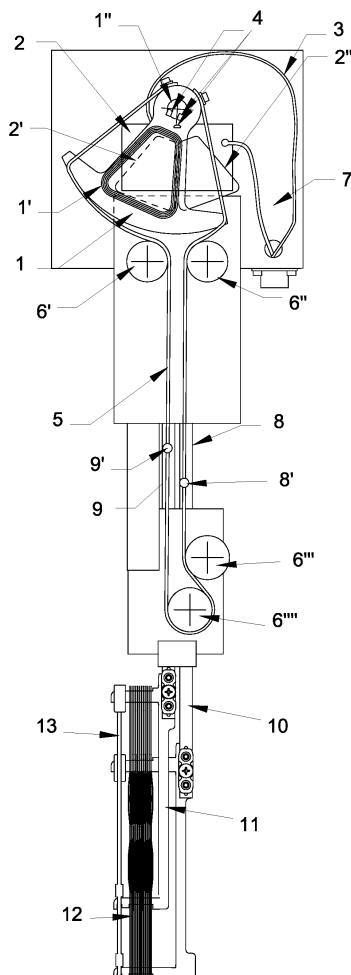


Fig. 1

Description

[0001] The present invention refers to an angular servo-motor for the controlled positioning of elements connected to weft or warp yarns in a weaving machine.

[0002] More specifically, the invention regards an angular position control servo-motor, adapted to drive a device dedicated to the control of one or more weft or warp yarns, which determines the positioning of an element adapted to interact with the yarn or yarns to which it is dedicated.

[0003] In the case of control of the yarns position, and in particular binding yarns of the side edges of a fabric, the mechanism which is object of the present invention permits actuating elements on which heddles (which control binding yarns) are mounted, so to obtain, on the sides of the fabric, the weaves with the weft yarns necessary for the formation and binding process of the fabric edges.

[0004] This operation regards the movement of the binding yarns known as "leno weave" and of the binding yarns of the false selvages.

[0005] There are currently known devices in which a system electrically drives a spring-actuated rotor of pendulum type, conferring an oscillatory movement to the assembly between two positions.

[0006] Nevertheless, this device type does not have a position control, it has limited torques, insufficient for specific applications, and finally with such devices it is not possible to pre-select the oscillation amplitude, which is determined in unequivocal manner by the structural geometry.

[0007] Finally, such devices have difficulties controlling the positions at the oscillation ends.

[0008] Another controlled positioning device known today is of parallelogram type; the structure of such device is moreover mechanically complex and, due to the lever devices and the mass of the movable equipment, it has a greater inertia, a smaller electrical efficiency and a higher cost with respect to the device which is object of the present invention.

[0009] A third type of controlled positioning devices currently known uses conventional servo-motors with stepper motors or "brushless" motors for the actuation of the small heddle-carrier looms; such devices, nevertheless, have considerable disadvantages due to the large size and overall cost of the group.

[0010] Object of the present invention is therefore that of overcoming the abovementioned drawbacks, and in particular that of realising an angular servo-motor for the controlled positioning of an element connected to a yarn, in a weaving machine, which permits obtaining an adequate position control and which permits at the same time conferring to the rotor movement and thus to the heddles the movement diagram most adapted to the weaving needs of the article being processed.

[0011] Another object of the invention is that of realising an angular servo-motor for the controlled positioning of an element connected to a yarn in a weaving machine

which permits predetermining the oscillation amplitude of the rotor, so to actuate a movement flexibility adapted to the user needs.

[0012] Further object of the invention is that of realising an angular servo-motor for the controlled positioning of an element connected to a yarn, in a weaving machine, which is of simple, compact, and rational construction and of reduced size with respect to the prior art, adapted to function at high speed, so to be usable for all applications, without reaching high temperature levels of the electrical components and maintaining excellent position control at the ends of the oscillation arc.

[0013] Such objects are achieved by realising an angular servo-motor for the controlled positioning of an element connected to a yarn, in a weaving machine, according to the attached claim 1.

[0014] Other technical characteristics are mentioned in the subsequent claims.

[0015] Advantageously, the device, object of the present invention, permits the position control which permits conferring to the movement of the rotor, and thus to the heddles, the motion diagram most adapted to the weaving needs of the article being processed.

[0016] The direct current is sent to the rotor, actuated by a control which permits predetermining the oscillation amplitude; moreover, the system, simple and of reduced size, is equipped with a high torque, which makes it adapted for all applications. Finally, the simple construction, easily inspected, permits operation in dusty environments and in the presence of vibrations, and furthermore the low inertia of the masses in alternating motion permit use at high speeds, maintaining low temperature levels of the electrical components and good control of the positions in the oscillation arc.

[0017] Further characteristics and advantages of an angular servo-motor for the controlled positioning of an element connected to a yarn, in a weaving machine, according to the present invention, will be more evident from the following description and from the attached drawings, provided as exemplifying and not limiting, wherein:

- Figure 1 shows a front schematic view of an angular servo-motor for the controlled positioning of an element connected to a yarn, in a weaving machine, according to the present invention;
- Figure 2 shows a side schematic view of the angular servo-motor of figure 1, according to the invention.

[0018] The device, object of the present invention, is essentially composed of an angular position control motor, with direct current sent to a "brushless" rotor connected to a sequence of elements, consisting of cables and small heddle carrier looms, capable of conferring an alternating motion to the aforesaid small heddle carrier looms, such to obtain desired weaves between weft yarns and warp yarns.

[0019] With reference to the mentioned figures, the an-

gular servo-motor according to the present invention is substantially composed of a rotor 1, rotating on the shaft 1", which makes up part of the fixing plate 2.

[0020] The rotor 1, in turn, is composed of a winding 1', through which an electrical current flows, fed from the conductor 3, and is equipped with control sensors 4.

[0021] Moreover, on the stator 7 magnets 2', 2" are fixed, appropriately shaped for such purpose.

[0022] The movable elements which make up the device, object of the invention, comprise in sequence a cable 5, which slides around the transmission pulleys 6', 6", 6"', 6'''' and is bound to the heddle-carrier rods 8 and 9 respectively in the points 8' and 9'. The two ends of the cable 5 finally connect to the oscillating body of the rotor 1, while the heddle-carrier rods are fixed to the small looms 10, 11 on which the heddles 12 of the false selvages and the heddles 13 of the "leno weave" are preferably further mounted.

[0023] From the above description, the characteristics of the angular servo-motor are clear for the controlled positioning of an element connected to a yarn, in a weaving machine, which is object of the present invention, as its advantages are also clear.

[0024] In particular, these regard the following aspects:

- simple, compact structure of easy inspection, of reduced size and dimensions, without complex and/or costly mechanical components;
- possibility to carry out a position control, which permits conferring, to the movement of the rotor and therefore the heddles, the movement diagram most adapted to the weaving needs of the article being processed;
- possibility of predetermining the oscillation amplitude of the rotor;
- possibility of obtaining a high torque, for use in any type of application;
- possibility of operating even in dusty environments and in the presence of vibrations;
- low inertia of the masses in alternating motion and consequent possibility of use at high speeds, without reaching high temperature levels of the electrical components;
- maintenance of an excellent position control, even at the ends of the oscillation arc.

[0025] It is clear, finally, that numerous other variants can be made to the angular servo-motor in question without departing from the principles of novelty inherent in the inventive idea, thus as it is clear that, in the practical actuation of the invention, the materials, forms and dimensions of the illustrated details may be of any type/size, and the same can be substituted with other technical equivalent elements.

Claims

1. Angular servo-motor for the controlled positioning of an element connected with a yarn, in a weaving machine, of the type comprising at least one position control angular motor adapted to electrically actuate at least one oscillating rotor around a pivot, which by rotating transmits the motion to elements connected to at least one yarn, **characterised in that** said angular motor is of the type with direct current, which is sent to a rotor (1) with the possibility to predetermine the oscillation amplitude, said rotor (1) being connected to a sequence of movable elements, comprising cables (5) and small heddle-carrier looms (10, 11), so to confer an alternating motion to said small heddle-carrier looms (10, 11) such to obtain the desired weaves between weft and warp yarns.
2. Angular servo-motor as in claim 1, **characterised in that** said rotor (1) is of "brushless" type.
3. Angular servo-motor as in claim 1, **characterised in that** said rotor (1) is rotating on a shaft (1").
4. Angular servo-motor as in claim 3, **characterised in that** said rotor (1) is composed of a winding (1'), through which an electrical current runs, supplied by at least one conductor (3), which originates from a fixing plate (2).
5. Angular servo-motor as in claim 4, **characterised in that** said rotor (1) and stator (7) include control sensors (4) of the oscillation amplitude.
6. Angular servo-motor as in claim 1, **characterised in that** said motor comprises at least one stator (7), on which appropriate shaped magnets are fixed (2', 2").
7. Angular servo-motor as in claim 1, **characterised by** movable elements and that said movable elements comprise, in sequence, at least one cable (5), whose ends are connected to the oscillating body of said rotor (1), said cable (5) being positioned so to slide around a plurality of transmission pulleys (6', 6", 6"', 6''') and being bound to respective rods (8, 9) in specific points (8', 9').
8. Angular servo-motor as in claim 7, **characterised in that** the small heddle-carrier looms (10, 11) are fixed to said rods (8, 9).
9. Angular servo-motor according to claim 8, **characterised in that** a plurality of heddles are mounted on said small heddle-carrier looms (10, 11), and preferably at least one series of heddles (12) of the false selvages and at least one series of heddles (13) of

the "leno weave".

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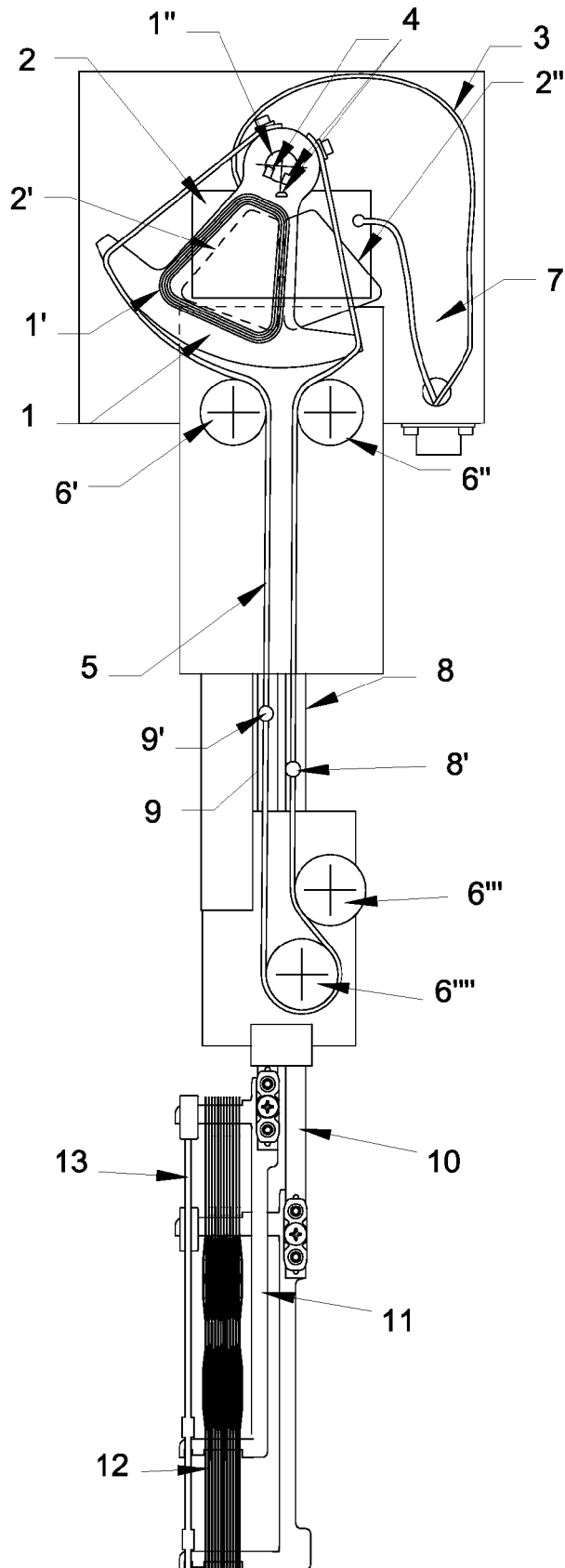


Fig. 1

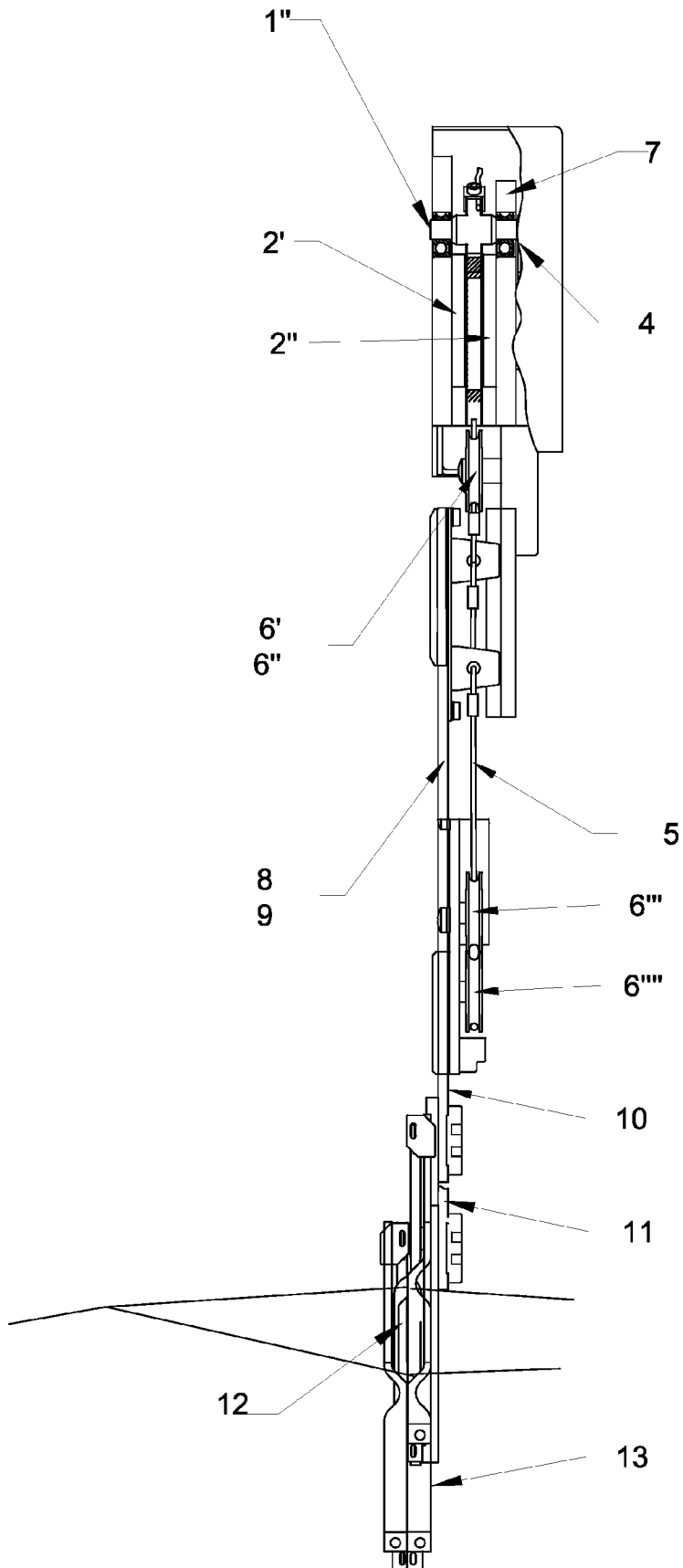


Fig. 2