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(54) METHOD FOR CONTROLLED TENSIONING OF WARP YARNS ON A TEXTILE MACHINE, AND RELATED TEXTILE MACHINE

(57) Warp yarns (3) unwound from a supply unit (2) moves to reach a yarns-interlacing area (5), wherein a textile product (6) is formed. A dragging roller (8) advances the textile product (6) away from the yarns-interlacing area (5), keeping a selected target advancement speed Vtv. A braking action is achieved on the warp yarns (3) upstream of the dragging roller (8), to provide a supply traction force SF along the warp yarns (3). Monitoring of the supply traction force is achieved based on an instant value DT of a drag torque applied by the dragging roller (8). A target value SFtv of the supply traction force is kept during operation of the textile machine (1) by repeated control cycles, each comparing the instant value DT with a target value DTtv of the drag torque, corresponding to said target value SFtv of the supply traction force. The braking action is modulated to keep the supply traction force SF at the target value SFtv.

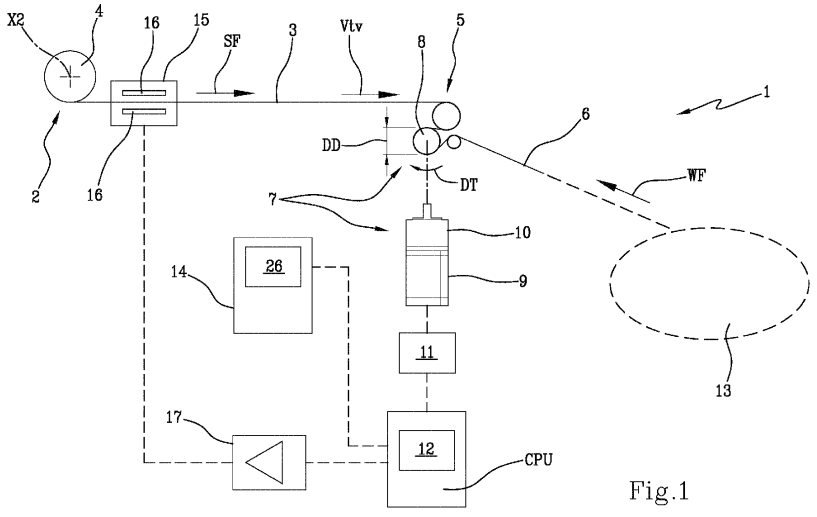

Fig.1

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Description

[0001] The present invention relates to a method for controlled tensioning of warp yarns on a textile machine, and a textile machine configured for implementing such a method.

[0002] The invention can be conveniently applied on weaving machines, such as rapier looms, air-jet looms, water-jet looms, shuttle looms, narrow ribbon weaving machines, etc, as well as on knitting machines etc, to improve product quality by an effective control of the tensioning of the warp yarns moving towards a yarns-interlacing area.

[0003] In the disclosure of the present invention, "reel" means a spool, reel, beam or other type of cylindrical body carrying threads, yarns or textile products wound into coils around a generally cylindrical core. By "electric motor" is meant an electric induction motor, such as a DC motor, brushless DC motor, AC motor or, preferably, an AC servo motor.

[0004] "Brake" can be a real brake, e.g. operating by friction, magnetic induction, etc., or a motor operated in "brake-mode", i.e. generating energy in consequence of an imposed rotation to the rotor thereof.

[0005] Textile machines typically provide at least one supply unit, e.g. one or more supply spools or reels from which warp yarns or threads are delivered towards a yarns-interlacing area. At the yarns-interlacing area, yarns-interlacing devices are driven to form a textile product by interlacing the warp yarns supplied from the supply unit, possibly with insertion of weft yarns and/or other yarns depending on the type of the machine and/or required textile pattern.

[0006] A dragging drive system including a dragging roller operates on the textile product at the yarns-interlacing area or immediately downstream thereof, to pull the warp yarns from the supply unit and move the textile product away from the yarns-interlacing area. Downstream of the yarns-interlacing area, the textile product is collected into a container or by winding it into superposed coil on a winding reel.

[0007] Textile machines are often actuated by at least one main electric motor being part of the dragging drive system. The pulling action exerted by the rotating dragging roller withdraws the warp yarns by unwinding them from the supply unit and longitudinally moving the unwound warp yarns towards the yarns-interlacing area.

[0008] The supply unit may comprise a plurality of reels from which the warp yarns are unwound upon action of the dragging roller. A braking arrangement may be employed to keep a desired supply traction force along the warp yarns, upstream of the yarns-interlacing area. For example, known braking devices comprises an idle-redirecting rollers assembly, which operates on the warp yarns to detect the warp yarns tension by load cells detectors. A braking unit acts on an unwind drum or intermediate roller which engages the warp threads coming from respective spools carried by a creel. The braking unit is driven upon signals provided by the load cell detectors, to adjust the braking action exerted on the supply drum, in response to variations in the tension of the warp yarns.

[0009] Where large reels or beams are employed as supply units, a supply motor may be provided to positively rotate the supply unit in a direction promoting unwinding of the warp yarns. The supply motor is controlled by a dancer roller acting on the warp yarns to maintain a desired supply traction force along these latter, e.g. by promoting rotation on the supply unit when the supply tensioning force is growing over a given threshold. The present invention aims to improve and simplify the known arrangement for monitoring and/or adjusting the tension of the warp yarns during operation of the textile machine.

[0010] In this regard, a scope of the present invention is to improve the prior art, in particular by providing a method and an apparatus which achieves the above specified accurate controls by a simplified and cheap arrangement. More particularly, the invention aims to propose an arrangement wherein an accurate tensioning control of the warp yarns may be achieved without needing load cells, dancer rollers and/or other kind of additional sensors, so to achieve an improved reliability and simplified construction.

[0011] An additional aim of the invention is that an accurate just-in-time control of the tensioning of the warp yarns leading to the dragging roller may be easily achieved even during operation of the textile machine.

[0012] According to the invention, the applicant found that an accurate tensioning control on the warp yarns may be efficiently achieved by detecting the instant value of the torque transmitted to the dragging roller to determine the instant value of the tensioning force applied to the warp yarns. The torque transmitted to the dragging roller can be easily adjusted to keep such torque at a desired target value which correspond to the desired target tensioning force of the warp yarns.

[0013] More particularly, the invention relates to a method for controlled tensioning of warp yarns on a textile machine, wherein: warp yarns are unwound from a supply unit and longitudinally moved to reach a yarns-interlacing area; a textile product including said warp yarns is formed at the yarns-interlacing area; a dragging roller engages the textile product near the yarns-interlacing area; a drag motor rotates the dragging roller to advance the textile product away from the yarns-interlacing area; a drag controller electronically controls the drag motor for keeping a selected target advancement speed Vtv of the textile product.

[0014] A braking action is achieved on the warp yarns upstream of the dragging roller, to provide a supply traction force SF along the warp yarns themselves.

[0015] Preferably, repeated control cycles are achieved during operation of the textile machine, each comprising:

acquiring an instant value DT of a drag torque, or at

least one parameter representative thereof, applied to the dragging roller;
determining an instant value of the traction force SF as a function of the instant value DT of the drag torque, or said least one parameter representative thereof.

[0016] In a further aspect, the invention relates to a textile machine, comprising: at least one supply unit configured for carrying warp yarns; yarns-interlacing devices acting at a yarns-interlacing area for producing a textile product by the warp yarns supplied from the supply unit; a dragging roller configured to engage the textile product near the yarns-interlacing area, and advance it away from the yarns-interlacing area; a drag motor acting on the dragging roller to rotate it at a dragging angular speed to pull the warp yarns from the supply unit and advance the textile product away from the yarns-interlacing area; a drag electronic control unit equipping the drag motor and configured for acquiring a supply current value of the drag motor; a drag controller configured for electronically controlling the drag motor to keep a selected target advancement speed Vtv of the textile product, and acquiring an instant value of a drag torque DT, or at least one parameter representative thereof, applied to the dragging roller as a function of the drag supply current; a brake acting on the warp yarns upstream of the dragging roller, to provide a supply traction force SF along the warp yarns themselves.

[0017] Preferably, a central processing unit is configured determining an instant value of the supply traction force SF as a function of the instant value of the drag torque DT, or of said at least one parameter representative thereof.

[0018] The applicant observed that the tensioning of the warp yarns leading to the yarns-interlacing area is directly related to the instant value of a torque applied on the dragging roller by a respective motor.

[0019] To the aim of the present invention and claims, referral to any value of the drag torque such as either instant value DT and the target value DTtv, are also meant as consisting of any parameter representative of the drag torque value.

[0020] For example, a supply current of the drag motor may be considered as a representative parameter of the drag torque. Indeed, the torque value applied to the dragging roller is directly related to the supply current of the drag motor. Since the supply current value typically represents one of the input parameters for operation of the textile machine, an accurate monitoring of the warp tensioning is thus achievable without the need for additional sensor devices.

[0021] In at least one preferred embodiment, the invention may also include one or more of the following preferred technical features.

[0022] Preferably, said at least one parameter representative of the value of the drag torque is the value of a drag torque.

[0023] Preferably, said at least one parameter representative of the value of the drag torque is the supply current of the drag motor.

[0024] Preferably, a target value SFtv of the supply traction force SF is kept during operation of the textile machine by said repeated control cycles, each repeated control cycle further comprising:

comparing the acquired instant value DT of the drag torque with a predetermined target value DTtv of the drag torque, corresponding to said target value SFtv;
increasing said braking action when DT < DTtv;
decreasing said braking action when DT > DTtv.

[0025] Variations in the braking action and in the drag torque mutually compensate to prevent uncontrolled tension in the warp yarns leading to defects or quality changes in the textile product. Therefore, the invention allows an easy monitoring and adjustment of the warp yarns tension during operation of the textile machine, by constantly adapting the desired tension to the drag torque in response to possible changes on anyone among all functional parameters during operation of the textile machine. Preferably, each of said repeated control cycles further comprises modulating the braking action to keep the supply traction force at said target value.

[0026] Preferably, increasing and decreasing the braking action is achieved simultaneously to increasing and decreasing, respectively, the drag torque.

[0027] Preferably, each of said repeated control cycles further comprises:

driving the drag motor (9) to increase the drag torque when DT < DTtv;
driving the drag motor (9) to decrease the drag torque when DT > DTtv.

[0028] Preferably, driving the drag motor to increase and decrease the drag torque is achieved by increasing and decreasing, respectively, a supply current of the drag motor.

[0029] Indeed, the value of the supply current is proportionally related to the drag torque value.

[0030] Preferably, the supply traction force SF depends on the drag torque transmitted from the drag motor to the dragging roller.

[0031] Preferably, the warp yarns are pulled from the supply unit by the dragging roller.

[0032] Preferably, no tension is applied on the textile product downstream of the dragging roller.

[0033] Preferably, a constant tension is applied to the textile product downstream of the dragging roller.

[0034] Preferably, the central processing unit is configured for driving the brake for modulating the braking action to keep the supply traction force at said target value.

[0035] Preferably, a comparator is configured for comparing the acquired instant value DT of the drag torque

with a predetermined target value DTtv of the drag torque, corresponding to a target value SFtv of the supply traction force.

[0036] Preferably, the central processing unit is configured for driving the brake to:

increase said braking action when DT < DTtv;
decrease said braking action when DT > DTtv.

[0037] This facilitates maintaining the supply traction force SF at said target value SFtv.

[0038] Preferably, the brake comprises braking pads configured for being mutually urged one toward the other by a braking force, to act directly by friction on the warp yarns sliding therebetween.

[0039] Preferably, the brake acts on at least one redirection roller, around which the warp yarns are wound, for applying a braking force opposing rotation of the redirection roller.

[0040] Preferably, the brake is configured to oppose rotation of a supply reel, roller or unwinding drum of the supply unit.

[0041] Preferably, the brake operates by friction or magnetic induction. Preferably, the brake comprises a brake-mode operated electric motor that generates energy in consequence of an imposed rotation to a rotor thereof.

[0042] Preferably, the central processing unit is configured for driving the brake by a brake controller comprising an actuator acting on the braking pads to adjust the braking force.

[0043] Preferably, the central processing unit is configured for driving the brake by a brake controller configured to adjust an electric load applied to the brake-mode operated motor to adjust the braking force.

[0044] Preferably, provision is made of a display unit connected with the central processing unit to display an instant value of the supply traction force SF and/or any deviance thereof with respect to the set target value SFtv. Additional features and advantages will be clearer from the detailed description of a preferred but not exclusive embodiment of a method for controlled tensioning of warp yarns on a textile machine, and a weaving machine configured for implementing such a method, in accordance with the present invention. Such description will be set forth hereinbelow with reference to the set of drawings, provided only as a non-limiting example, wherein:

- figure 1 schematically shows a side elevation sectional view of an exemplary textile machine 1 equipped with a control system for implementing the method according to the present invention;
- figure 2 is an operation logic flowchart of the textile machine 1 implementing the tensioning control method according to the invention.

[0045] In figure 1, a textile machine 1 is generally indicated by reference 1. The textile machine 1 may be, for example, a rapier loom, air-jet loom, water-jet loom, shuttle loom, a narrow ribbon weaving machines, a knitting machine or other type of textile machine 1.

[0046] The textile machine 1 comprises at least one supply unit 2, for example in the form of at least one supply reel or roller, from which plurality of warp yarns 3 is drawn as the supply unit 2 rotates around a respective unwind rotation axis X2. If desired, the reel can be driven by a motor (not shown) which assist unwinding of the warp yarns 3 to prevent over-tensioning thereof.

[0047] In a different embodiment not shown, the supply unit 2 may comprise a plurality of spools carried by a cradle. A motor-driven unwinding drum 4 may operate on the warp yarns 3 to rotate around the unwind rotation axis X2 downstream of the creel, to provide a positive supply of the warp yarns 3 for over-tensioning prevention.

[0048] The warp yarns 3 drawn from the supply unit 2 are longitudinally moved to reach a yarns-interlacing area 5 (e.g. a weaving area or knitting area), wherein yarns-interlacing devices (not shown) operate for producing a textile product 6 from the warp yarns 3 supplied by the supply unit 2. To this aim, the warp yarns 3 may be linked each other and/or with one or more weft yarns, and/or other additional yarns, in any known manner which is herein not disclosed as not forming part of the present invention. The yarns-interlacing devices typically may include or consist of thread guiding elements cooperating with oscillating members: they are not shown in the drawings, as they may be realized in many different knows manners depending on the needs.

[0049] A dragging unit 7 engages the textile product 6 near the yarns-interlacing area 5, i.e. at the yarns-interlacing area 5 or immediately downstream of it. The dragging unit 7 comprises a dragging roller 8 acting on the textile product 6 to advance it away from the yarns-interlacing area 5. The dragging roller 8 also produces a pulling action on the warp yarns 3 coming from the supply unit 2. In figure 1, DD indicates a dragging diameter defined by the dragging roller 8, at an external surface thereof acting without slippage on the textile product 6. A drag motor 9 is connected to the dragging roller 8 preferably through a drag gearbox reducer 10, to rotate the dragging roller 8 at a controlled angular speed, and submitting the dragging roller itself to a controlled drag torque DT. The drag motor 9 is conveniently governed by a respective drag electronic control unit 11, which is capable to control the rotation speed, supply current, and/or other operational parameters of the drag motor 9. A brushless-type motor equipped with the drag electronic control unit 11 can be conveniently used as drag motor 9.

[0050] The drag electronic control unit 11 is capable of detecting at any moment a rotation speed n9 of the drag motor 9, i.e. a rotor thereof. Preferably, the rotation speed n9 is received as an input signal by a drag controller 12, to calculate a dragging rotation speed n8 of the dragging roller 8 basing on the value of a drag transmission ratio i10 of the respective drag gearbox reducer 10 by the formula

$$n8 = n9 / i10.$$

[0051] The drag controller 12 may be embedded within the drag electronic control unit 11 or separated therefrom, for example as a part of a central processing unit CPU overseeing the operation of the entire textile machine 1 or a relevant part thereof as shown in figure 1.

[0052] The textile product 6 moving from the yearns-interlacing area 5 is advanced towards a collecting unit 13. In a preferred embodiment, the collecting unit 13 is such that no tension or a substantially constant tensioning WF be applied on the textile product 6 downstream of the dragging roller 8. Such a collecting unit 13 may be obtained in many different ways which are not relevant for the scope of the invention, e.g. it may comprise a motor-driven winding reel, or merely consist of a collecting box configured to receive the textile product 6.

[0053] During operation of the textile machine 1, the dragging roller 8 advances the warp yarns 3 and the textile product 6 at a selected target advancement speed Vtv that may be set by the central processing unit CPU, e.g from the user through an input interface 14, or by selection from a stored menu. The target advancement speed Vtv is then controlled and/or maintained by the drag controller 12, e.g. by a PID or other suitable control loop logic, by adjusting the rotation speed n9 of the drag motor 9 so that the rotation speed n8 matches the target advancement speed Vtv by the formula:

$$Vtv = n8 * DD * \pi.$$

[0054] The warp yarns 3 are pulled from the supply unit 2 by the dragging roller 8, while said reel, roller or unwinding drum 4 of the supply unit 2 rotates upon the unwind rotation axis X2 to unwind the warp yarns 3 that move towards the yearns-interlacing area 5.

[0055] A brake 15 is provided to achieve a braking action on the warp yarns 3 upstream of the dragging roller 8. In one embodiment, the brake 15 may comprise braking pads 16 operating between the supply unit 2 and the dragging roller 8. The braking pads 16 are mutually urged one toward the other to act directly by friction on the warp yarns 3 sliding therebetween, as schematically shown in figure 1.

[0056] In an alternative embodiment not shown, the brake 15 can act on one or more idle redirection rollers, around which the warp yarns 3 travelling along their path towards the yearn-interlacing area 8 are wound. At least in this latter case, the brake 15 may be configured for opposing rotation of one or more of said idle redirection rollers.

[0057] In a further alternative arrangement, the brake 15 may be configured for acting on the supply reel, roller or unwinding drum 4 of the supply unit 2, for opposing rotation around the unwind rotation axis X2.

[0058] The brake 15 may comprise a real brake 15, e.g. operating by friction, magnetic induction, etc. or, at least when configured for opposing rotation, a brake-mode operated motor, i.e. an electric motor that generates energy in consequence of an imposed rotation to the rotor thereof.

[0059] The brake 15 can be driven upon control by the central processing unit CPU, through a brake controller 17 that may comprise an actuator acting on the braking pads 16 to adjust the braking force. If a brake-mode operated motor is used as brake 15, the brake controller 17 may be configured to adjust an electric load applied to the brake-mode operated motor, to modulate the braking force.

[0060] The action of the brake 15 during operation of the textile machine 1 opposes movement of the warp yarns 3 toward the yarns-interlacing area 5, although without preventing the required movement of the warp yarns 3. Thus, a supply traction force SF is created and maintained along the warp yarns 3 upstream of dragging roller 8.

[0061] An efficient control of the supply traction force SF is critical for the correct execution of the mutual interlinking of the warp yarns 3 each other and/or with the weft yarns and/or other yarns at the yearns-interlacing area 5.

[0062] On the other hand, the supply traction force SF may be influenced by a series of parameters that are not easily predictable and/or controllable.

[0063] For example, at least when the supply unit 2 is in the form of a reel carrying the warp yarns 3 wound around the unwind rotation axis X2, rotation of the supply unit 2 causes the external diameter thereof to gradually decrease as the warp yarns 3 are unwound from the unwinding reel 15. Therefore, the supply traction force SF would gradually increase in response to a progressive reduction of the unwinding diameter during operation of the textile machine 1 if the braking action opposing rotation around the unwind rotation axis X2 were kept constant. Additionally, especially if warp yarns 3 are supplied from many different spools or reels, small brakes or simple friction elements possibly added to create some load would not allow precise control, tending to introduce fluctuations in the supply traction force SF. Variations of the supply traction force SF may also be required by the job program.

[0064] According to the invention, a positive control of the supply traction force SF is performed to keep this latter at a desired target value SFtv, by achievement of repeated control cycles as herein explained with particular reference to figure 2.

[0065] At or just after start of the textile machine 1 (see diagram block 18 in figure 2), the desired target value SFtv of the supply traction force SF may be conveniently set by the user (diagram block 19). For example, the target value SFtv may be directly entered or selected from a menu stored into the central processing unit CPU, through the input interface 14. The target value SFtv may also be part of a job program, e.g. selected through the

input interface 14 from a job programs menu previously stored in the central processing unit CPU.

[0066] If desired, the target value SFtv of the supply traction force SF may be changed according to the pre-established job program during operation of the textile machine 1, for example to be increased and/or reduced along with prosecution of the job in response to changes in the weaving pattern executed in the yearns-interlacing area 5. Indeed, for example, a pre-established weaving pattern may include a production stage wherein, e.g. due to insertion of additional yarns in the yearns-interlacing area 5 or for other reasons, the supply traction force SF is required to be greater or lower than a previous or subsequent production stage, for optimization of the result.

[0067] During operation of the textile machine 1, the drag controller 12 repeatedly queries the drag electronic control unit 11 to acquire an instant value of the drag torque DT.

[0068] The instant value of the drag torque DT may be derived by the drag controller 12 by calculation as a function of a supply current I9 of the drag motor 9. More particularly, the value of the supply current I9 is acquired by the drag electronic control unit 11 (diagram block 20). Then (diagram block 21), the instant value of the drag torque may be calculated as a function of the supply current I9 of the drag motor 9, according to the formula:

$$DT = I9 * kT9 * i10$$

wherein kT9 represents the torque constant of the drag motor 9. As known, the torque constant is a motor specific value, typically expressed in Nm/A unit.

[0069] The instant value of the drag torque DT is directly related to the instant value of the supply force SF according to the formula:

$$SF = DT * 2 / DD + WF$$

which also considers the effect of the tensioning WF possibly applied to the textile product 6 leading to the collecting unit 13. If desired, the tensioning force WF may be detected by known sensor systems acting on the textile product downstream of the dragging unit 7.

[0070] A comparator (not shown), e.g. embedded within the central processing unit CPU or separated therefrom, is provided for comparing (block diagram 22) the instant value of the drag torque DT with the target value DTtv thereof. The target value DTtv of the drag torque can be easily calculated basing on the pre-established target value SFtv, by the formula:

$$DTtv = (SFtv - WF) * DD/2.$$

[0071] If the instant value of the drag torque DT equals the target value DTtv, a new supply adjustment cycle is achieved.

[0072] Otherwise (diagram block 23), the comparator determines if the instant supply traction force SF is smaller than the target value SFtv. In the affirmative, the central processing unit CPU drives the brake 15 through the brake controller 17, to increase the braking action on the warp yarns 3 (diagram block 24). Otherwise, the braking action is decreased (diagram block 25).

[0073] As above described, the drag controller 12 drives the drag motor 9 to keep the desired target value Vtv of the advancement speed. Consequently, in response to the increasing and decreasing the braking action, the drag controller 12 simultaneously drives the drag motor 9 by increasing or reducing the supply current I9 to increase and decrease, respectively, the drag torque applied by the dragging roller 8, so to maintain the advancement speed at the desired target value Vtv. Increasing and decreasing the braking action also causes a corresponding increasing and decreasing, respectively, of the supply traction force SF towards the target value SFtv, so that this latter is kept unchanged or substantially unchanged.

[0074] Any adjustment in the braking action may trigger a new supply adjustment cycle as shown in figure 2. As additional or alternative measure, reiteration of the supply traction force control cycle may occur at a desired frequency, preferably comprised between 1 Hz and 10 Hz. This frequency may be kept constant or gradually vary during operation of the machine.

[0075] A display unit 26, for example embedded into the input interface 14, may be conveniently provided and governed by the central processing unit CPU for displaying the instant value of the supply traction force SF, and/or any deviance thereof with respect to the set target value SFtv. This facilitates the operator to be constantly informed about the correct operation of the textile machine 1.

Claims

1. Method for controlled tensioning of warp yarns on a textile machine, wherein:

   warp yarns (3) are unwound from a supply unit (2) and longitudinally moved to reach a yarns-interlacing area (5);
   a textile product (6) including said warp yarns (3) is formed at the yarns-interlacing area (5);
   a dragging roller (8) engages the textile product (6) near the yarns-interlacing area (5);
   a drag motor (9) rotates the dragging roller (8) to advance the textile product (6) away from the yarns-interlacing area (5);
   a drag controller (12) electronically controls the drag motor (9) for keeping a selected target advancement speed Vtv of the textile product (6);
   wherein a braking action is achieved on the warp

yarns (3) upstream of the dragging roller (8), to provide a supply traction force SF along the warp yarns (3) themselves;
wherein repeated control cycles are achieved during operation of the textile machine (1), each comprising:

acquiring an instant value DT of a drag torque, or at least one parameter representative thereof, applied to the dragging roller (8);
determining an instant value of the traction force SF as a function of the instant value DT of the drag torque, or said at least one parameter representative thereof.

2. Method according to claim 1, wherein a target value SFtv of the supply traction force SF is kept during operation of the textile machine (1) by said repeated control cycles, each repeated control cycle further comprising:

comparing the acquired instant value DT of the drag torque with a predetermined target value DTtv of the drag torque, corresponding to said target value SFtv of the supply traction force;
increasing said braking action when DT < DTtv;
decreasing said braking action when DT > DTtv.

3. Method according to claim 2, wherein increasing and decreasing the braking action is achieved simultaneously to increasing and decreasing, respectively, the drag torque DT.

4. Method according to claim 3, wherein each of said repeated control cycles further comprises:

driving the drag motor (9) to increase the drag torque when DT < DTtv;
driving the drag motor (9) to decrease the drag torque when DT > DTtv.

5. Method according to one or more of the preceding claims, wherein driving the drag motor (9) to increase and decrease the drag torque DT is achieved by increasing and decreasing, respectively, a supply current of the drag motor (9).

6. Textile machine, comprising:

at least one supply unit (2) configured for carrying warp yarns (3);
yarns-interlacing devices acting at a yarns-interlacing area (5) for producing a textile product (6) by the warp yarns (3) supplied from the supply unit (2);
a dragging roller (8) configured to engage the textile product (6) near the yarns-interlacing area (5), and advance it away from the yarns-interlacing area (5);
a drag motor (9) acting on the dragging roller (8) to rotate it at a dragging angular speed to pull the warp yarns (3) from the supply unit (2) and advance the textile product (6) away from the yarns-interlacing area (5);
a drag electronic control unit (11) equipping the drag motor (9) and configured for acquiring a supply current I9 of the drag motor (9);
a drag controller (12) configured for electronically controlling the drag motor (9) to keep a selected target advancement speed Vtv of the textile product (6), and acquiring an instant value of a drag torque DT, or at least one parameter representative thereof, applied to the dragging roller (8) as a function of the supply current 19 of the drag motor (9);
a brake (15) acting on the warp yarns (3) upstream of the dragging roller (8), to provide a supply traction force SF along the warp yarns (3) themselves;
a central processing unit (CPU) configured determining an instant value of the supply traction force SF as a function of the instant value of the drag torque, or of said at least one parameter representative thereof.

7. Textile machine according to claim 6, further comprising a comparator configured for comparing the acquired instant value DT of the drag torque with a predetermined target value DTtv of the drag torque, corresponding to a target value SFtv of the supply traction force;
the central processing unit (CPU) being further configured for driving the brake (15) to:

increase said braking action when DT < DTtv;
decrease said braking action when DT > DTtv,
to keep the supply traction force SF at said target value SFtv.

8. Textile machine according to claim 6 or 7, wherein the brake (15) comprises braking pads (16) configured for being mutually urged one toward the other by a braking force, to act directly by friction on the warp yarns (3) sliding therebetween.

9. Textile machine according to one or more of claims 5 to 8, wherein the brake (15) acts on at least one redirection roller, around which the warp yarns (3) are wound, for applying a braking force opposing rotation of the redirection roller.

10. Textile machine according to one or more of claims 5 to 9, wherein the brake (15) is configured to oppose rotation of a supply reel, roller or unwinding drum (4) of the supply unit (2).

11. Textile machine according to claim 9 or 10, wherein the brake (15) comprises a brake-mode operated electric motor that generates energy in consequence of an imposed rotation to a rotor thereof.

12. Textile machine according to one or more of claims 8 to 11, wherein the central processing unit (CPU) is configured for driving the brake (15) by a brake controller (17) comprising an actuator acting on the braking pads (16) to adjust the braking force.

13. Textile machine according to claim 11, wherein the central processing unit (CPU) is configured for driving the brake (15) by a brake controller (17) configured to adjust an electric load applied to the brake-mode operated motor to adjust the braking force.

14. Textile machine according to one or more of claims 6 to 13, further comprising a display unit (26) connected with the central processing unit CPU to display an instant value of the supply traction force SF and/or any deviance thereof with respect to the set target value SFtv.

15. Textile machine according to one or more of claims 6 to 14, wherein the drag motor (9) is driven to:

increase the drag torque when DT < DTtv;
decrease the drag torque when DT > DTtv.

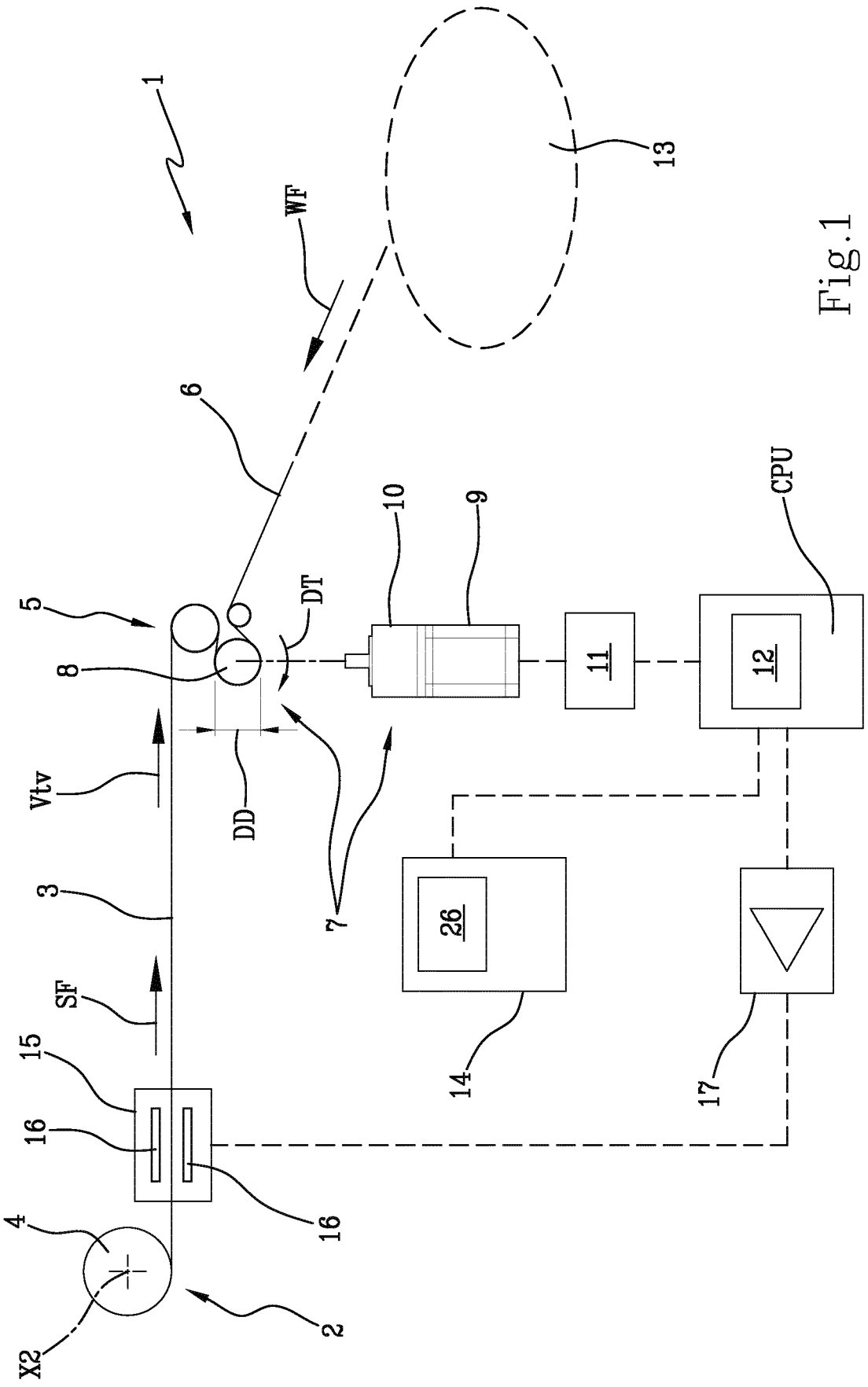

Fig.1

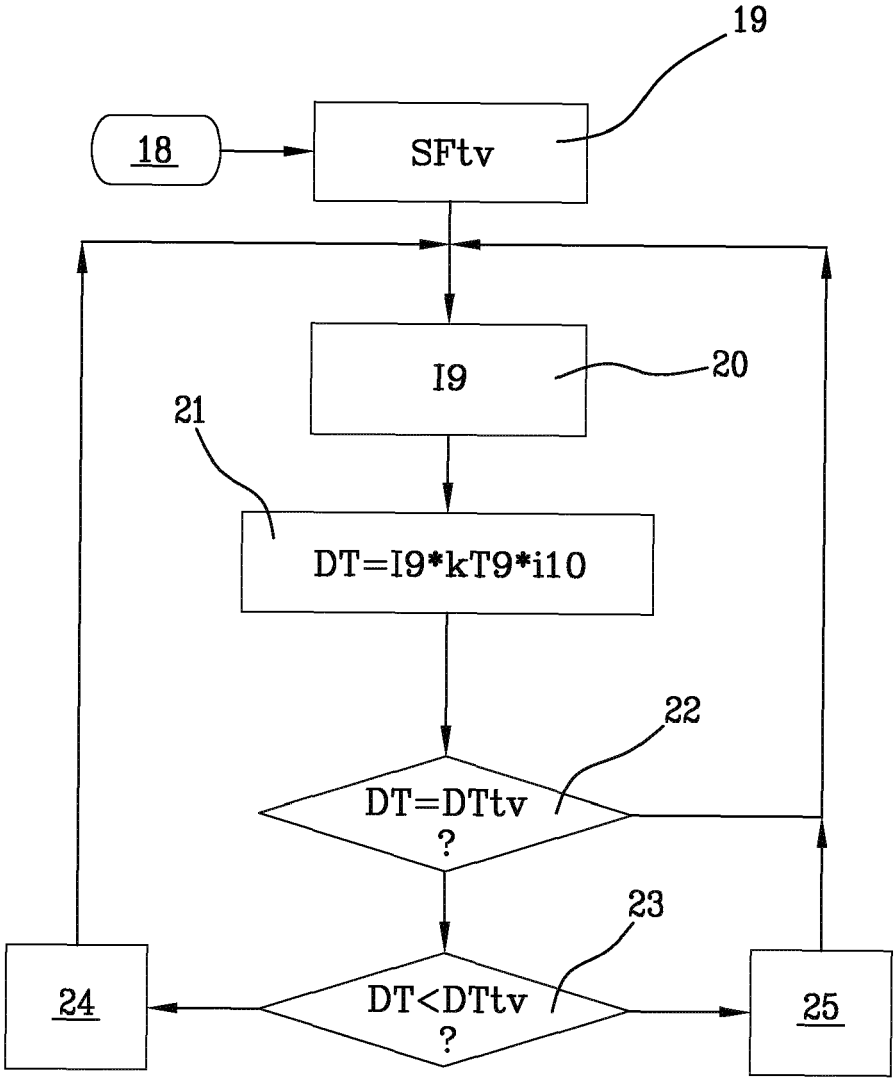

Fig.2

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EUROPEAN SEARCH REPORT

Application Number
EP 23 21 6232

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The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	13 May 2024	Heinzelmann, Eric

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X : particularly relevant if taken alone
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