



(11)

EP 2 828 424 B1

(12)

EUROPEAN PATENT SPECIFICATION

(45) Date of publication and mention
of the grant of the patent:
16.03.2016 Bulletin 2016/11

(51) Int Cl.:
D02J 3/16 ^(2006.01) **D06C 9/00** ^(2006.01)
D06C 9/02 ^(2006.01)

(21) Application number: **13713394.8**

(86) International application number:
PCT/EP2013/055817

(22) Date of filing: **20.03.2013**

(87) International publication number:
WO 2013/139855 (26.09.2013 Gazette 2013/39)

(54) DEVICE AND METHOD TO ELIMINATE FLUFF FROM A YARN

VORRICHTUNG UND VERFAHREN ZUM ENTFERNEN VON FLUSEN AUS EINEM FADEN
DISPOSITIF ET PROCÉDÉ D'ÉLIMINATION DE DUVET D'UN FIL

(84) Designated Contracting States:
**AL AT BE BG CH CY CZ DE DK EE ES FI FR GB
GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO
PL PT RO RS SE SI SK SM TR**

(30) Priority: **21.03.2012 IT UD20120047**

(43) Date of publication of application:
28.01.2015 Bulletin 2015/05

(73) Proprietor: **SSM Schärer Schweiter Mettler AG
8810 Horgen (CH)**

(72) Inventors:
• **ZAMATTIO, Sergio**
I-33170 Pordenone (IT)
• **MARCHIORI, Mirko**
I-33081 Aviano (IT)

• **MACCABRUNI, Davide**
CH-8800 Thalwil (CH)

(74) Representative: **Petraz, Davide Luigi et al**
GLP S.r.l.
Viale Europa Unità, 171
33100 Udine (IT)

(56) References cited:
GB-A- 309 320 GB-A- 189 610 198
JP-A- 6 264 323 US-A- 3 421 746
US-A- 6 151 764

• **DATABASE WPI Week 201015 Thomson**
Scientific, London, GB; AN 2010-A96251
XP002680201, -& CN 201 381 408 Y (LUFENG CO
LTD) 13 January 2010 (2010-01-13)

Note: Within nine months of the publication of the mention of the grant of the European patent in the European Patent Bulletin, any person may give notice to the European Patent Office of opposition to that patent, in accordance with the Implementing Regulations. Notice of opposition shall not be deemed to have been filed until the opposition fee has been paid. (Art. 99(1) European Patent Convention).

Description

FIELD OF THE INVENTION

[0001] The present invention concerns a device and the connected method suitable to eliminate the fluff present in yarns, especially those obtained mainly with short fibers, whether they are of vegetable, animal, artificial or synthetic origin.

BACKGROUND OF THE INVENTION

[0002] The so-called singeing method is known, by means of which a yarn which has an unacceptable degree of fluff, is made to transit inside a processing zone or a processing chamber, in proximity to a source of energy able to supply sufficient energy to burn the tips of the fibers protruding from the body of the yarn and which make up the fluff.

[0003] Singeing carried out by known techniques is generally managed by adjusting only the speed of transit of the yarn in proximity to the source of energy, because this is the most easily controllable plant design parameter.

[0004] The relation of inverse proportionality between fluff and the processing speed of the yarn, so that as the level of initial fluff increases there is a corresponding proportional reduction in the work speed, with obvious repercussions on the productivity of the plant, represents a limit and an important disadvantage of known singeing machines.

[0005] It is therefore one purpose of the present invention to be able to obtain an adequate elimination of the fluff, at least equal to the results obtainable with known techniques, increasing the processing speed of the yarn and hence the productivity of the plant.

[0006] In common practice, in the various known singeing solutions, there is also a high energy consumption, due to the fact that the energy is poorly used since the zone where the energy is generated is considerably oversized with respect to the dimensions of the fluff to be eliminated, and the energy is therefore greatly dispersed in the zone adjacent to the yarn.

[0007] It is therefore another purpose of the present invention to obtain a reduction of the specific energy consumption, that is, the energy consumption per unit of mass of the yarn, of the singeing process.

[0008] Another disadvantage of known singeing processes is connected to the degradation of the basic color of the body of the yarn, due to the fact that, to increase the reduction in fluff, the yarn is subjected for a longer time to the action of the flame. This is a serious disadvantage, because it requires remedies such as purging and bleaching, which are burdensome both in terms of working times, which is detrimental for productivity, and also in terms of cost, which is disadvantageous for the competitiveness of the product on the market.

[0009] Another purpose of the present invention is

therefore to actuate a method which is effective in eliminating the fluff from a yarn, and which allows to obtain good surface qualities of the yarn itself, without compromising the inner quality, so as to render the processing cheaper and quicker.

[0010] The prior art document US-A-6.151.764 describes a device and a method for singeing yarns, in particular for making carpets, in which the yarn is made to pass first in one direction then in the opposite direction in proximity to the flame of the singeing device. The prior art document JP-A-6264323 instead describes a singeing device in which the yarn follows, two or more times, a transverse path immediately above the tip of the flame. Furthermore, this document describes how the yarn follows a path first in one direction then in the other direction and then again in the first direction. The prior art document GB-A-10.198 provides to make a yarn transit two or more times in an opposite and crossed direction with a path immediately above the tip of the flames produced by burners disposed adjacent to each other.

[0011] These known solutions have the considerable disadvantage that the segments of yarn that translate simultaneously in a reciprocally inverse direction, and close to each other, generate a considerable reciprocal disturbance; this is because perturbations are created in the flame, and contrasting drawing effects on the flame and on the streams of air surrounding it, due to the opposite motion of adjacent segments of the yarn. This has a very negative influence on the singeing performance.

[0012] Furthermore, the solutions where the yarn passes through the flame in a substantially transverse direction have a very poor performance, also because the drawing and accompanying effect, due to the motion of the yarn when it transits in proximity to the flame, is in no way exploited.

[0013] The reduced performance of the singeing operation is even more accentuated as the passes in the singeing zone become more numerous and the higher the transit speeds of the yarn are, and in current machines, and with the production requirements currently requested, these can reach as much as 1,200 meters per minute.

[0014] It must be considered that, in gas singeing machines, the flame that develops in the processing zone, and which the yarn being worked passes through, has a length of about 100÷120 mm, and the yarn passes through the flame at a speed that can be comprised between 800 and 1,200 m/min; this means a passage time of about 6/1,000 of a second in which the fluff present on the surface of the yarn has to be burnt.

[0015] As the transit speed increases, the disturbances, the turbulence and possible contacts between the yarns advancing in opposite directions are accentuated, determining a considerable drop in performance and efficiency of the process.

[0016] Furthermore, if the two segments of yarn moving in opposite directions touch, the reciprocal speeds are added together, and the high-speed sliding causes new fluff that makes the singeing operation already per-

formed inefficient.

[0017] In those solutions known in the state of the art where two or more passes are provided, no control is contemplated of the tension of the yarn between one pass and the other, which tension increases with each pass after the first.

[0018] An excessive tension in the subsequent passes, in particular for yarns with a fine or extra-fine count, can take the yarn to the limit point of its resistance, with consequent risks of fraying and breakage. On the contrary, if the tension is kept low to avoid these risks, at least for the first pass the yarn has too low a tension, and there may be instability, vibrations and slow oscillations of the yarn, and therefore poor performance of the process.

[0019] The Applicant has devised, tested and embodied the present invention to overcome the shortcomings of the state of the art and to obtain these and other purposes and advantages.

SUMMARY OF THE INVENTION

[0020] The present invention is set forth and characterized in the independent claims, while the dependent claims describe other characteristics of the present invention or variants to the main inventive idea.

[0021] In accordance with the above purposes, a singeing method according to the present invention provides that a yarn, advancing at constant speed, or adjustable in a controlled manner, along a singeing machine, is made to transit through a suitable processing zone in which a source of high-intensity energy is positioned, to perform a first pass to remove the fluff.

[0022] In a first non-restrictive solution, said source of high-intensity energy is at least a gas flame generator. In another solution, also non-restrictive, the source of high-intensity energy is at least an electric arc generator. Hereafter in the description, where the word flame is used, it must be understood that similar or equivalent considerations can apply, as and when possible, for electric arcs or other similar or equivalent energy forms.

[0023] One characteristic of the present invention provides that the yarn, exiting from the processing zone, is picked up and diverted, outside the processing zone, to be returned toward the processing zone and to transit, substantially continuously, at least a second time inside the above-mentioned processing zone, in order to effect at least a second pass to remove the fluff, after the first pass. According to the present invention, the second pass occurs in a concordant direction, or same direction, as the first pass. A control and adjustment of the tension of the yarn is also provided at at least one point of the diversion, guide and return path between the first pass and the second pass.

[0024] In other words, the yarn exiting from the singeing zone is made to transit in cooperation with at least two, advantageously three or more, drawing and/or controlled diversion means, suitable to perform a controlled

adjustment of the tension applied to the yarn. Such drawing and/or controlled diversion means are configured to determine a diversion path on the yarn, which returns the yarn itself to follow, for at least a second time, for a second pass, the segment in the processing zone with the same direction of advance as in the first pass.

[0025] In a preferred solution, during the second pass the segment of yarn is disposed substantially parallel, and in a position closely adjacent to the segment of yarn which is carrying out the first pass.

[0026] If a third, fourth or larger number of passes of the yarn is provided in the processing zone, the invention provides that all these passes occur in the same direction of advance.

[0027] In a preferred form of embodiment of the present invention, if the source of energy determines the formation of a flame in proximity to which the yarn is made to pass, the yarn in the processing zone moves in the same direction in which the flame develops.

[0028] The fact that the directions of advance of the yarn in correspondence with the processing zone are equal, and even more the fact that the directions of advance with respect to the development of the flame are also equal, determines substantial advantages in terms of performance and efficiency of the process.

[0029] In fact, the convective motions of the air created by the transit of the yarn, in two or more parallel and concordant segments, advantageously reciprocally close and also very near to the flame as well, determine a drawing effect on the flame itself; the flame thus accompanies the yarn for a certain segment beyond the specific generation zone, prolonging the effect deriving from the closeness between flame and fluff and hence increasing the efficiency of the singeing process. Furthermore, no reciprocal effects of turbulence and disturbance are created in the streams of air determined by crossings and passes in opposite directions.

[0030] The multiple and concordant passes of the yarn in the processing zone therefore allow to increase the effect of burning the fluff, since the time the yarn remains in the processing zone is at least doubled, in close proximity and substantial temporal continuity, with the advantage of obtaining a better exploitation of the energy possessed by the above-mentioned source of energy and of obtaining a better level of singeing.

[0031] This gives another advantage of using a singeing method with multiple and concordant passes, due to the possibility of carrying out all the passes of the yarn at greater working speeds than those currently used in the state of the art, which gives an increased productivity of the plant. The increased productivity is directly proportional to the ratio between the standard processing speeds used in the state of the art, and those used in a singeing machine which carries out the multiple pass, and for some types of yarn can even exceed 100%.

[0032] Given the same level of fluff of the yarn at start and end of processing, and given the same overall consumption of energy by the plant, compared with the state

of the art, the method using the multiple and concordant pass also has the advantage that it reduces the specific energy consumption, that is, the energy consumption per unit of mass of the yarn processed. This value is calculated as ratio between the overall energy consumption of a plant and its productivity.

[0033] Another advantage of the present invention is that multiple and concordant passes at relatively high speeds have less impact on the quality of the body of the yarn, compared with a single pass at standard speed. The removal of the fluff made by a process with multiple passes is substantially equal to the sum of partial removals made by individual intermediate processes which, while being individually less effective compared with a pass made at a lower speed, also have lesser depth, and are therefore less harmful for the body of the yarn. The present invention is therefore advantageous in that it allows to have less recourse to purging and bleaching downstream of singeing.

[0034] A further improvement of the process is obtained by using cleaning means, such as for example scrapers and brushes, which are positioned so as to act, sliding, on the surface of the drawing means, for example rolls or calenders, in a zone of the surface thereof where there is no yarn, in order to keep the surface of the roll or calender clean.

[0035] The cleaning means cooperate with suction means, associated at least with the processing zone and with the drawing and alignment means, and having the function of aspirating and removing along at least part of the path of the yarn, the products of combustion, the fumes and the dust or particulate, which could dirty or ruin the yarn.

[0036] The above-mentioned fact that the yarn passes several times inside the processing zone gives the advantage that it is exposed more to suction and recovery, and is hence cleaner at the end of the singeing process.

[0037] According to a secondary characteristic of the present invention, at least a tension sensor cooperates with the drawing and/or controlled diversion means, and with winding means that can be motorized or idle, to control and adjust the speed of the yarn according to the tension detected by the tension sensor.

[0038] As we said, a larger number of singeing passes entails a larger number of diversions of the yarn, which cause an increase in the tensions acting upon it, making it necessary to accurately control the tensions that progressively accumulate on the yarn, and to possibly intervene on the drawing and/or diversion means along the path of the yarn. Consequently, a greater control is advantageously obtained, by means of the drawing and/or diversion means, of the tensions to which the yarn is subjected along its path, hence safeguarding the correct collection conditions and preventing breakages and weakening of the yarn.

[0039] It is within the spirit of the invention to provide that the drawing and/or diversion means and the winding means are synchronized with respect to each other.

[0040] Another secondary characteristic of the present invention is to provide that the adjustment of the processing speed and/or the number of passes is correlated to the value of fluff of the yarn measured at entry to the processing zone, or the one measured at exit from the processing zone, or both, thus allowing the real-time management of the quality of the yarn, in every condition and for every requirement.

[0041] The adjustments as above have the common purpose of optimizing the process of eliminating the fluff according to the present invention, and advantageously can lead to a considerable reduction in energy consumption if compared with the consumption of known processes.

[0042] According to another secondary characteristic, the present invention provides that the yarn can be selectively distanced from and brought near to the processing zone. In this way it is possible to perform, outside the zone, in the distancing step, management operations of the singeing machine, such as heddling and the re-launching of the yarn, which can therefore be repositioned, in the subsequent approach or repositioning step, inside the processing zone.

[0043] To this purpose, a movement device is provided, which connects the device for eliminating fluff to the singeing machine and comprises an actuator, suitable to move the fluff eliminating device with respect to the singeing machine, to selectively extract and insert the yarn in the processing zone.

[0044] Other advantages due to the present invention are the possibility of inserting the yarn in the processing zone when a predetermined value of speed is reached, controlling the tensions inside the processing zone, to prevent stretching and breakage of the yarn, controlling the collection tension in order to facilitate the formation of reels for dye works.

DESCRIPTION OF THE DRAWINGS

[0045] These and other characteristics of the present invention will become apparent from the following description of some preferential forms of embodiment, given as a non-restrictive example with reference to the attached drawings wherein:

- fig. 1 shows schematically a first form of embodiment of a device according to the invention;
- figs. 2 and 3 show schematically two possible variants of the form of embodiment in fig. 1;
- figs. 4 and 5 show schematically a variant of fig. 1, in two different configurations.

[0046] In the following description, the same reference numbers indicate identical parts of the device for eliminating fluff according to the present invention, even in different forms of embodiment. It is understood that elements and characteristics of one form of embodiment can conveniently be incorporated into other forms of em-

bodiment without further clarifications.

DESCRIPTION OF SOME PREFERENTIAL FORMS OF EMBODIMENT OF THE PRESENT INVENTION

[0047] With reference to fig. 1, a device according to the present invention to eliminate fluff from a yarn 11, is indicated in its entirety by the reference number 10 and is inserted into a singeing machine 12 comprising a generator device 13, suitable to generate a source of energy 14, which defines a processing zone 15, inside which the yarn 11 is made to transit and the process of eliminating the fluff is carried out.

[0048] The source of energy 14 can be, for example, the flame generated by a gas burner. However, it comes within the spirit of the present invention to use alternative energy sources, for example sources generating an electric arc or others, suitable to obtain a burning process on a yarn in transit.

[0049] Hereafter we shall mainly describe a flame in the above non-restrictive meaning.

[0050] In the form of embodiment shown in fig. 1, the yarn 11 unwinds from a feed reel 16, is presence-controlled by a first sensor or feeler 18, the level of fluff is detected by a fluff detector 19, then it is tensed by the combined action of a yarn-guide roll 21 and a tensioner 22.

[0051] Then the yarn 11 is disposed along a first axis of advance A1 by a first aligner guide 23, positioned in proximity to an entry zone 25 of the processing zone 15, and a second aligner guide 24 positioned in proximity to an exit zone 26 of the processing zone 15.

[0052] In the segment comprised between the first and second aligner guide 23, 24, the part of yarn 11 that is inside the processing zone 15 is subjected to a first pass of removing the fluff, or singeing, indicated in fig. 1 by a first arrow F1, directed from the entry zone 25 to the exit zone 26.

[0053] The aligner guide 24 also has the function of diverting, in this case by about 90°, the path of the yarn 11.

[0054] Then the yarn 11 is picked up again by a drawing and/or diversion roll 29, which in the case shown in fig. 1 is made to rotate by a motor 30, to be diverted thereby and directed along a return axis R1, outside the processing zone 15.

[0055] According to a variant, not shown, the drawing and/or diversion roll 29 is not motorized and has only a diversion function. According to other variants, not shown, the aligner guide 23 and/or the aligner guide 24 are also motorized.

[0056] The path of the yarn 11 is then again diverted by a third aligner guide 31, positioned in proximity to the entry zone 25 and cooperating with a fourth aligner guide 32, positioned downstream of the processing zone 15, to align the yarn 11 along a second axis of advance A2, in this case substantially parallel to the first axis of advance A1.

[0057] A variant, not shown in the drawings, provides

that the yarn 11 is diverted by the first aligner guide 23, instead of the third aligner guide 31, and that the first aligner guide 23 cooperates with the fourth aligner guide 32.

[0058] In the segment comprised between the third and fourth aligner guides 31, 32, the part of the yarn 11 that is inside the processing zone 15 is subjected to a second pass of removing the fluff, or singeing, indicated in fig. 1 by a second arrow F2, directed from the entry zone 25 to the exit zone 26 and hence concordant with respect to the first arrow F1.

[0059] Afterward, the presence of the yarn 11 is again controlled by a second sensor or feeler 36, downstream of the processing zone 15, is made to transit, in this non-restrictive case, inside a traversing flue 37 and then picked up again by a winding roll 38, which is driven by a motor 39.

[0060] In the non-restrictive form of embodiment shown, in proximity to the traversing flue 37 there is a tension sensor 40, which controls the tension of the yarn 11 and possibly adjusts the drive of the winding roll 38, acting on its motor 39, to control the winding conditions of the yarn 11 onto a collection reel 43, driven by a corresponding motor 44.

[0061] As we said, as well as the winding roll 38, which is motorized, the drawing and/or diversion roll 29 and the aligner guides 23, 24, 31 and 32 can also be motorized or idle; this is to determine a guide, diversion and return system, outside the processing zone 15 which, as well as returning the yarn 11 to the processing zone 15, performing at least a second pass, concordant with respect to the first, of the yarn 11 in cooperation with the source of energy, also allows to adjust the tension of the yarn 11 which increases as the number of passes increases.

[0062] For example, if the drawing and/or diversion roll 29 is motorized, its peripheral drawing speed of the yarn 11 will be greater than the peripheral speed of the winding roll 38 at least by 5%, advantageously at least by 10%, in order to discharge the increase in tension on the yarn 11 due to the diversions.

[0063] If one or more of the aligner guides 23, 24, 31 or 32 are also motorized, their speeds will be greater than that of the winding roll 38 at least by 5%, advantageously at least by 10%. This is to discharge the increase in tension that has accumulated by the yarn 11 at every pass.

[0064] Fig. 2 shows a second form of embodiment of the present invention. In this drawing, the same reference number is given to identical or equivalent components as those in fig. 1; furthermore, for clarity of representation, some components have been omitted.

[0065] In the solution shown in fig. 2, there are two drawing and/or diversion rolls 124 and 131 which, in practice, perform the function of the aligner guides 24 and 31 and of the drawing and/or diversion roll 29 of the solution in fig. 1.

[0066] In this case the yarn 11 is picked up again at exit from the processing zone 15 by the first drawing and/or diversion roll 124, which can be fixed, idle or mo-

torized, which causes an inversion in the movement of the yarn 11 of about 180°. The second drawing and/or diversion roll 131, which can also be fixed, idle or motorized, causes a new inversion of the yarn 11 of about 180°, to return it inside the processing zone 15 so that a second pass can be carried out, having the same direction of advance as the first pass.

[0067] In this case too, if one or both the drawing and/or diversion rolls 124 and 131 are motorized, their peripheral speed of drawing the yarn 11 is preferably greater than the peripheral speed of the winding roll 38 by at least 5%, advantageously at least 10%.

[0068] Fig. 3 shows a third form of embodiment of the present invention. In this figure, the same reference number is given to the same or equivalent components as those in fig. 1; moreover, for clarity of representation, some components have been omitted.

[0069] In the solution in fig. 3, there are four drawing and/or diversion rolls, respectively 29, 231a and 231b and the aligner guide 24 also with function of drawing and/or diversion roll. As in the previous cases, the four drawing and/or diversion rolls 24, 29, 231a and 231b can be all fixed or idle, or motorized, or partly fixed, partly idle and partly motorized.

[0070] If they are motorized, the peripheral speed of the drawing and/or diversion rolls, 24, 29, 231a and 231b is preferably greater than the peripheral speed of the winding roll 38 by at least 5%, advantageously at least 10%.

[0071] It comes within the spirit of the invention to provide, for each form of embodiment described above, that suction means 47, shown in fig. 1, are associated both with the processing zone 15, and with the drawing and/or diversion roll 29 and with the traversing flue 37, to suck in and convey fumes, dust, particles and combustion products of the fluff inside a suction collector 48.

[0072] Cleaning means for cleaning the yarn 11, which in this case comprise scrapers 49, are associated with the drawing and/or diversion roll 29 and the second aligner guide 24, and have the function of cleaning their surface, in the segment which at that moment is free of the passage of the yarn 11, by scraping the residues or dirt present on the surface of the latter.

[0073] The cleaning means cooperate with the suction means 47, which discharge the residues and the dirt once they have been removed from the yarn 11.

[0074] According to a variant of the present invention (figs. 4 and 5), a movement device 50 is connected to the singeing machine 12 and to the fluff eliminating device 10, and is suitable to move at least part of the latter during the heddlng or relaunching steps of the yarn 11, which can occur for example at start-of-processing or following accidental breakages of the yarn 11. The movement device 50 comprises an actuator 51, in this case the pneumatic type, the cylinder 53 of which is attached externally to the singeing machine 12 and to a fixed upright 52, also attached to the singeing machine 12. The piston 54 of the actuator 51 is connected to a first girder 59, having

one end hinged to the fixed upright 52 and the other end hinged on a mobile upright 58. A second girder 55 has one end hinged in correspondence to the top of the fixed upright 52, and one end hinged to the mobile upright 58, so as to define, with the first girder 59 and the two uprights 52, 58, a kinematism of the parallelogram type. At a lower end of the mobile upright 58 a reel-carrier feed base 61 is made solid, on which the feed reel 16 is fixed, while at an upper end of the mobile upright 58 a support 62 is made solid, on which the drawing and/or diversion roll 29 and the second aligner guide 24 are mounted. The yarn-guide roll 21, the tensioner 22, the first aligner guide 23 and the third aligner guide 31 are also made solid with the mobile upright 58.

[0075] The action of the actuator 51 selectively moves the mobile upright 58 closer to or away from the singeing machine 12, and consequently the elements made solid therewith. In the heddlng step (fig. 4), the piston 54 is at its maximum extension, so that the yarn 11 can be correctly positioned along its path while it is outside the processing zone 15 and the traversing flue 37.

[0076] In the working position (fig. 5), the piston 54 is totally retracted inside the cylinder 53 and the mobile upright 58 is positioned in proximity to the fixed upright 52. In this position, the yarn 11 is disposed and aligned as described previously and is able to be subjected to the singeing processes.

[0077] For every form of embodiment of the present invention, but shown here by way of example only in fig. 1, a processing, control and command unit 64 is provided, which receives the information from the various members connected to it, such as the feelers 18, 36, the tensioner 22, the generator device 13, the fluff detector 19, the motor 30 of the drawing and/or diversion roll 29, which carries known torque indicator means, the tension sensor 40, the movement device 50, the motor 39 of the winding roll 38, the motor 44 of the collection reel 43, which carry speed and torque indicator means and any other possible motors that drive the various guides and/or drawing and/or diversion rolls.

[0078] Based on the information collected and on the possible programs connected to the type of yarn 11 and the desired fluff at exit, the processing unit 64 conditions the functioning of the device 10, adjusting the speed of the yarn 11 and/or the characteristics of the source of energy 14, acting for example on the generator device 13 and/or acting on the motors 30, 39, 44.

[0079] It should be noted here that with the invention it is possible both to adjust a single yarn completely, providing independent fluff elimination devices 10, and also to drive several devices 10, by common members which drive both the winding roll 38 and also the corresponding collection reels 43.

[0080] It also comes within the spirit of the invention to adjust the device 10 and/or the movement device 50 either manually or semi-automatically.

Claims

1. Method to eliminate fluff from a yarn (11), comprising a first step in which said yarn (11) is made to transit in a processing zone (15) of a singeing machine (12) in which a source of high intensity energy (14) is positioned in order to carry out a first pass (F1) of removing the fluff, and at least a second step in which said yarn (11), exiting from said processing zone (15), is picked up again and diverted in order to be made to transit substantially continuously at least a second time inside said processing zone (15), in proximity to said source of energy (14), in order to carry out at least a second pass (F2) of removing the fluff, **characterized in that** said second pass (F2) occurs in a direction concordant with the first pass (F1), a control and adjustment also being provided of the tension of the yarn (11) in at least one point of the diversion, guide and return path, between the first pass (F1) and the second pass (F2).
2. Method as in claim 1, **characterized in that** in the case where said source of energy (14) determines the formation of a flame in proximity to which the yarn (11) is made to transit, the yarn (11) in the processing zone (15) moves in the same direction in which the flame develops.
3. Method as in claim 1 or 2, **characterized in that** after the at least one second pass (F2) in the processing zone (15) it provides a step of winding the yarn (11), carried out by a motorized winding roll (38).
4. Method as in any claim hereinbefore, **characterized in that** between the first pass (F1) and the second pass (F2) a step of diversion, guide and return of the yarn (11) is provided, carried out by at least two guides and/or diversion rolls (29, 23, 24, 31 and 32; 124, 131; 231a, 231b).
5. Method as in claims 3 and 4, wherein it provides that at least one of said guides and/or diversion rolls (29, 23, 24, 31 and 32; 124, 131; 231a, 231b) is motorized and driven at an adjustable peripheral speed and in any case higher than that of said winding roll (38).
6. Method as in claim 5, **characterized in that** the peripheral drawing speed of the yarn (11) of the motorized guides and/or diversion roll or rolls (29, 23, 24, 31 and 32; 124, 131; 231a, 231b) is at least 5% higher, advantageously at least 10%, than the peripheral speed of the winding roll (38).
7. Method as in any claim hereinbefore, **characterized in that** the number of passes to remove the fluff of said yarn (11) inside said processing zone (15) is adjustable according to the type of said yarn (11)
8. Method as in any claim hereinbefore, **characterized in that** it provides that the tension of said yarn (11) is constantly controlled along the path of said yarn (11) in said singeing machine (12), and that a control unit (64) acts on the motors at least of said winding roll (38) and/or one or more of said guides and/or diversion rolls (29, 23, 24, 31 and 32; 124, 131; 231a, 231b) to maintain or return the tension of the yarn (11) at/to a desired value.
9. Method as in any claim hereinbefore, **characterized in that** it provides to suck in and remove the fumes, dust and combustion products along at least part of the path of said yarn (11).
10. Method as in any claim hereinbefore, **characterized in that** it also comprises a step of distancing the yarn (11) from said processing zone (15), in order to effect, outside the latter, operations to manage said singeing machine (12), such as heddlng and re-launching the yarn (11), and an approach or repositioning step, after said distancing step, in which said yarn (11) is repositioned inside said processing zone (15).
11. Device to eliminate fluff from a yarn (11), comprising a singeing machine (12) defining at least a processing zone (15), in which a source of high intensity energy (14) is positioned, and guides and/or diversion rolls (29, 23, 24, 31 and 32; 124, 131; 231a, 231b) positioned on opposite sides with respect to said processing zone (15) and able to define a first segment of the path of said yarn (11) inside said processing zone (15), to carry out a first pass (F1) of removing the fluff, **characterized in that** said guides and/or diversion rolls (29, 23, 24, 31 and 32; 124, 131; 231a, 231b) are configured to define a guide, diversion and return path, to bring said yarn (11), exiting from the first pass (F1) in the processing zone (15), to complete at least a second pass (F2) in the processing zone (15) in the same direction as the first pass (F1), said second pass (F2) being in the same direction as said first pass (F1), the device also comprising means to control and adjust the tension of the yarn (11) disposed in at least one point of the diversion, guide and return path, between the first pass (F1) and the second pass (F2).
12. Device as in claim 11, **characterized in that** said means to control and adjust the tension of the yarn (11) comprise a motorized winding roll (38) disposed downstream of the singeing machine (12) and from which the yarn (11) exiting from the at least one second pass (F2) is drawn, and at least a guide and/or diversion roll (29, 23, 24, 31 and 32; 124, 131; 231a, 231b) disposed downstream of the singeing machine and/or its fluff.

chine (12) and on which the yarn (11) exiting from the first pass (F1) winds.

13. Device as in claim 12, **characterized in that** at least one of said guides and/or diversion rolls (29, 23, 24, 31 and 32; 124, 131; 231a, 231b) is motorized. 5
14. Device as in claim 12 or 13, **characterized in that** said means to control and adjust the tension of the yarn (11) also comprise at least a tension sensor (40) disposed along the path of the yarn (11) and a control unit (64), wherein said control unit (64) is configured to receive at least the value of the tension of the yarn (11) from said at least one tension sensor (40) and to act on the drive of said winding roll (38) and/or of at least one of said guides and/or diversion rolls (29, 23, 24, 31 and 32; 124, 131; 231a, 231b) in order to maintain or return the tension at/to to a desired value. 10
15. Device as in claim 14, **characterized in that** said control unit is configured to maintain the peripheral yarn drawing speed of the at least one motorized guide and/or diversion roll (29, 23, 24, 31 and 32; 124, 131; 231a, 231b) at a value higher than at least 5%, advantageously at least 10%, with respect to the peripheral speed of the winding roll (38). 15
16. Device as in any claim from 10 to 14, **characterized in that** a movement device (50) connects said device (10) to said singeing machine (12) and comprises an actuator (51), suitable to move said device (10) with respect to said singeing machine (12), in order to selectively extract and insert said yarn (11) from/into said processing zone (15). 20
17. Device as in any claim from 12 to 16, **characterized in that** it comprises cleaning means (49) associated at least to one of said guide and/or diversion rolls (29, 23, 24, 31 and 32; 124, 131; 231a, 231b). 25

Patentansprüche

1. Ein Verfahren zum Entfernen von Fusseln von einem Garn (11), umfassend einen ersten Schritt, in welchem das Garn (11) dazu gebracht wird, eine Bearbeitungszone (15) einer Sengmaschine (12) zu durchqueren, in welcher eine Quelle hoch intensiver Energie (14) positioniert ist, um einen ersten Durchlauf (F1) des Fusselentfernens durchzuführen, und zumindest einen zweiten Schritt, in welchem das Garn (11), welches die Bearbeitungszone (15) verlässt, wieder aufgenommen und umgelenkt wird, um dazu gebracht zu werden, im Wesentlichen kontinuierlich mindestens ein zweites Mal die Bearbeitungszone (15) innen, in der Nähe der Energiequelle (14), zu durchqueren, um mindestens einen zweiten 45

Durchlauf (F2) Fusselentfernens durchzuführen, **dadurch gekennzeichnet, dass** der zweite Durchlauf (F2) des in einer Richtung übereinstimmend mit dem ersten Durchlauf (F1) auftritt, wobei auch eine Steuerung/Regelung und Einstellung der Spannung des Garns (11) an mindestens einem Punkt des Umlenk-, Führungs- und Rückkehrwegs zwischen dem ersten Durchlauf (F1) und dem zweiten Durchlauf (F2) bereitgestellt wird.

2. Verfahren gemäß Anspruch 1, **dadurch gekennzeichnet, dass** in dem Fall, in dem die Energiequelle (14) die Bildung einer Flamme in der Nähe bestimmt, in der das Garn (11) zum Durchqueren gebracht wird, das Garn (11) sich in der Bearbeitungszone (15) in die gleiche Richtung bewegt, in die sich die Flamme entwickelt. 10
3. Verfahren gemäß Anspruch 1 oder 2, **dadurch gekennzeichnet, dass** nach dem mindestens einen zweiten Durchlauf (F2) in der Bearbeitungszone (15) ein Schritt des Aufwickelns des Garns (11) bereitgestellt wird, welcher durch eine motorisierte Wickelrolle (38) durchgeführt wird. 15
4. Verfahren gemäß einem der vorhergehenden Ansprüche, **dadurch gekennzeichnet, dass** zwischen dem ersten Durchlauf (F1) und dem zweiten Durchlauf (F2) ein Umlenk-, Führungs- und Rückkehrschritt des Garns (11) bereitgestellt wird, welcher durch mindestens zwei Führungs- und/oder Umlenkrollen (29, 23, 24, 31 und 32; 124, 131; 231a, 231b) durchgeführt wird. 20
5. Verfahren gemäß Anspruch 3 und 4, wobei es bereitstellt, dass zumindest eine der Führungs- und/oder Umlenkrollen (29, 23, 24, 31 und 32; 124, 131; 231a, 231b) motorisiert ist und bei einer einstellbaren Umfangsgeschwindigkeit angetrieben wird und in jedem Fall höher als die der Wickelrolle (38) ist. 25
6. Verfahren gemäß Anspruch 5, **dadurch gekennzeichnet, dass** die Umfangsziehgeschwindigkeit des Garns (11) der motorisierten Führungs- und/oder Umlenkrolle oder -rollen (29, 23, 24, 31 und 32; 124, 131; 231a, 231b) mindestens 5 % höher, vorteilhafterweise mindestens 10 % höher, als die Umfangsgeschwindigkeit der Wickelrolle (38) ist. 30
7. Verfahren gemäß einem der vorhergehenden Ansprüche, **dadurch gekennzeichnet, dass** die Anzahl der Durchläufe zum Entfernen der Fusseln des Garns (11) innerhalb der Bearbeitungszone (15) gemäß dem Typ des Garns (11) und/oder dessen Fusseln einstellbar ist. 35
8. Verfahren gemäß einem der vorhergehenden An- 40

- sprüche, **dadurch gekennzeichnet, dass** es bereitstellt, dass die Spannung des Garns (11) entlang des Wegs des Garns (11) in der Sengmaschine (12) konstant geregelt/gesteuert wird, und dass eine Steuerungs-/Regelungseinrichtung (64) zumindest auf die Motoren der Wickelrolle (38) und/oder einen oder mehrere der Führungs- und/oder Umlenkrollen (29, 23, 24, 31 und 32; 124, 131; 231 a, 231 b) wirkt, um die Spannung des Garns (11) bei/zu einem gewünschten Wert aufrechtzuerhalten/zurückzuführen.
9. Verfahren gemäß einem der vorhergehenden Ansprüche, **dadurch gekennzeichnet, dass** es ein Einsaugen und Entfernen der Dämpfe, Staub- und Verbrennungsprodukte entlang mindestens eines Teils des Wegs des Garns (11) bereitstellt.
10. Verfahren gemäß einem der vorhergehenden Ansprüche, **dadurch gekennzeichnet, dass** es auch einen Schritt des Distanzierens des Garns (11) von der Bearbeitungszone (15) umfasst, um außerhalb der Letzteren Vorgänge zum Handhaben der Sengmaschine (12) zu bewirken, wie zum Beispiel Kettfäden einziehen oder das Garn (11) neu zu starten, und einen Näherungs- oder Neupositionierungsschritt nach dem Distanzierungsschritt umfasst, in welchem das Garn (11) innerhalb der Bearbeitungszone (15) neu positioniert wird.
11. Vorrichtung zum Entfernen von Fusseln von einem Garn (11), umfassend eine Sengmaschine (12), welche mindestens eine Bearbeitungszone (15) definiert, in welcher eine Quelle hoch intensiver Energie (14) positioniert ist, und Führungs- und/oder Umlenkrollen (29, 23, 24, 31 und 32; 124, 131; 231 a, 231 b), welche in Bezug auf die Bearbeitungszone (15) auf gegenüberliegenden Seiten positioniert sind und dazu in der Lage sind ein erstes Segment des Wegs des Garns (11) innerhalb der Bearbeitungszone (15) zu definieren, um eine ersten Durchlauf (F1) des Fusselentfernens durchzuführen, **dadurch gekennzeichnet, dass** die Führungs- und/oder Umlenkrollen (29, 23, 24, 31 und 32; 124, 131; 231 a, 231 b) dazu konfiguriert sind, einen Führungs-, Umlenk-, und Rückkehrweg zu definieren, um das Garn (11), welches von dem ersten Durchlauf (F1) in der Bearbeitungszone (15) austritt, um zumindest einen zweiten Durchlauf (F2) in der Bearbeitungszone (15) in der gleichen Richtung wie der erste Durchlauf (F1) zu vervollständigen, wobei der zweite Durchlauf (F2) in der gleichen Richtung ist wie der erste Durchlauf (F1), wobei die Vorrichtung auch Mittel zum Regeln/Steuern und Einstellen der Spannung des Garns (11) umfasst, welche an mindestens einem Punkt des Führungs-, Umlenk-, und Rückkehrwegs zwischen dem ersten Durchlauf (F1) und dem zweiten Durchlauf (F2) angeordnet sind.
12. Vorrichtung gemäß Anspruch 11, **dadurch gekennzeichnet, dass** die Mittel zum Regeln/Steuern und Einstellen der Spannung des Garns (11) eine motorisierte Wickelrolle (38), welche abwärts der Sengmaschine (12) angeordnet ist, und von welcher das Garn (11), welches von dem mindestens einen zweiten Durchlauf (F2) austritt, gezogen wird, und mindestens eine Führungs- und/oder Umlenkrolle (29, 23, 24, 31 und 32; 124, 131; 231a, 231 b), welche abwärts der Sengmaschine (12) angeordnet ist und auf welche sich das Garn (11), welches den ersten Durchlauf (F1) verlässt, wickelt, umfassen.
13. Vorrichtung gemäß Anspruch 12, **dadurch gekennzeichnet, dass** mindestens eine der Führungs- und/oder Umlenkrollen (29, 23, 24, 31 und 32; 124, 131; 231 a, 231 b) motorisiert ist.
14. Vorrichtung gemäß Anspruch 12 oder 13, **dadurch gekennzeichnet, dass** die Mittel zum Regeln/Steuern und Einstellen der Spannung des Garns (11) auch mindestens einen Spannungssensor (40), welcher entlang des Wegs des Garns angeordnet ist, und eine Regel-/Steuereinheit (64) umfassen, wobei die Regel-/Steuereinheit (64) dazu konfiguriert ist, mindestens den Wert der Spannung des Garns (11) von dem mindestens einen Spannungssensor (40) zu empfangen und auf den Antrieb der Wickelrolle (38) und/oder von mindestens einer der Führungs- und/oder Umlenkrollen (29, 23, 24, 31 und 32; 124, 131; 231a, 231 b) zu wirken, um die Spannung bei/zu einem gewünschten Wert aufrechtzuerhalten/zurückzuführen.
15. Vorrichtung gemäß Anspruch 14, **dadurch gekennzeichnet, dass** die Steuereinheit dazu konfiguriert ist, die Umfangsgarnzuggeschwindigkeit von der mindestens einen motorisierten Führungs- und/oder Umlenkrolle (29, 23, 24, 31 und 32; 124, 131; 231a, 231 b) auf einem Wert höher als mindestens 5 %, vorteilhafterweise mindestens 10 %, gegenüber der Umfangsgeschwindigkeit der Wickelrolle (38) aufrechtzuerhalten.
16. Vorrichtung gemäß einem der Ansprüche 10 bis 14, **dadurch gekennzeichnet, dass** eine Bewegungsvorrichtung (50) die Vorrichtung (10) mit der Sengmaschine (12) verbindet und einen Aktor (51) umfasst, welcher geeignet ist, die Vorrichtung (10) gegenüber der Sengmaschine (12) zu bewegen, um das Garn (11) selektiv von/in der/die Bearbeitungszone (15) zu extrahieren und einzuführen.
17. Vorrichtung gemäß einem der Ansprüche 12 bis 16, **dadurch gekennzeichnet, dass** die Vorrichtung Reinigungsmittel (49) umfasst, welche mit mindestens einer der Führungs- und/oder Umlenkrollen (29, 23, 24, 31 und 32; 124, 131; 231 a, 231 b) verbunden

sind.

Revendications

1. Procédé d'élimination de duvet d'un fil (11), comprenant une première étape au cours de laquelle ledit fil (11) est amené à transiter dans une zone de traitement (15) d'une machine de flambage (12) dans laquelle une source d'énergie haute-intensité (14) est positionnée afin de réaliser un premier passage (F1) d'élimination du duvet, et au moins une deuxième étape au cours de laquelle ledit fil (11), sortant de ladite zone de traitement (15), est repris et dévié afin d'être amené à transiter de manière sensiblement continue au moins une deuxième fois à l'intérieur de ladite zone de traitement (15), à proximité de ladite source d'énergie (14), afin de réaliser au moins un deuxième passage (F2) d'élimination du duvet, **caractérisé en ce que** ledit deuxième passage (F2) a lieu dans une direction concordant avec le premier passage (F1), une commande et un ajustement de la tension du fil (11) étant également prévus dans au moins un point du chemin de déviation, de guidage et de retour, entre le premier passage (F1) et le deuxième passage (F2).
2. Procédé selon la revendication 1, **caractérisé en ce que** le cas où ladite source d'énergie (14) détermine la formation d'une flamme à proximité de laquelle le fil (11) est amené à transiter, le fil (11) dans la zone de traitement (15) se déplace dans la même direction dans laquelle la flamme se développe.
3. Procédé selon la revendication 1 ou 2, **caractérisé en ce que**, après l'au moins un deuxième passage (F2) dans la zone de traitement (15), il prévoit une étape d'enroulement du fil (11), réalisée par un cylindre d'enroulement motorisé (38).
4. Procédé selon l'une quelconque des revendications précédentes, **caractérisé en ce que**, entre le premier passage (F1) et le deuxième passage (F2), une étape de déviation, de guidage et de retour du fil (11) est prévue, réalisée par au moins deux guides et/ou cylindres de déviation (29, 23, 24, 31 et 32 ; 124, 131 ; 231a, 231b).
5. Procédé selon les revendications 3 et 4, dans lequel il prévoit qu'au moins un desdits guides et/ou cylindres de déviation (29, 23, 24, 31 et 32 ; 124, 131 ; 231a, 231b) soit motorisé et entraîné à une vitesse périphérique ajustable et dans tous les cas supérieure à celle dudit cylindre d'enroulement (38).
6. Procédé selon la revendication 5, **caractérisé en ce que** la vitesse d'étrépage périphérique du fil (11) des guides et/ou cylindre ou cylindres de déviation motorisés (29, 23, 24, 31 et 32 ; 124, 131 ; 231a, 231b) est supérieure d'au moins 5 %, avantageusement d'au moins 10 %, à la vitesse périphérique du cylindre d'enroulement (38).
7. Procédé selon l'une quelconque des revendications précédentes, **caractérisé en ce que** le nombre de passages pour éliminer le duvet dudit fil (11) à l'intérieur de ladite zone de traitement (15) est ajustable en fonction du type dudit fil (11) et/ou de son duvet.
8. Procédé selon l'une quelconque des revendications précédentes, **caractérisé en ce qu'il** prévoit que la tension dudit fil (11) soit constamment commandée le long du chemin dudit fil (11) dans ladite machine de flambage (12), et qu'une unité de commande (64) agisse sur les moteurs au moins dudit cylindre d'enroulement (38) et/ou d'un ou plusieurs desdits guides et/ou cylindres de déviation (29, 23, 24, 31 et 32 ; 124, 131 ; 231a, 231b) afin de maintenir ou de ramener la tension du fil (11) à une valeur souhaitée.
9. Procédé selon l'une quelconque des revendications précédentes, **caractérisé en ce qu'il** prévoit d'aspirer et d'éliminer les fumées, la poussière et les produits de combustion le long d'au moins une partie du chemin dudit fil (11).
10. Procédé selon l'une quelconque des revendications précédentes, **caractérisé en ce qu'il** prévoit également une étape consistant à reculer le fil (11) de ladite zone de traitement (15), afin d'effectuer, à l'extérieur de cette dernière, des opérations pour gérer ladite machine de flambage (12), telles que le rentrage et la relance du fil (11), et une étape d'approche ou de repositionnement, après ladite étape de recul, au cours de laquelle ledit fil (11) est repositionné à l'intérieur de ladite zone de traitement (15).
11. Dispositif d'élimination de duvet d'un fil (11), comprenant une machine de flambage (12) définissant au moins une zone de traitement (15), dans laquelle une source d'énergie haute-intensité (14) est positionnée, et des guides et/ou cylindres de déviation (29, 23, 24, 31 et 32 ; 124, 131 ; 231a, 231b) positionnés sur les côtés opposés par rapport à ladite zone de traitement (15) pouvant définir un premier segment du chemin dudit fil (11) à l'intérieur de ladite zone de traitement (15), pour réaliser un premier passage (F1) d'élimination du duvet, **caractérisé en ce que** lesdits guides et/ou cylindres de déviation (29, 23, 24, 31 et 32 ; 124, 131 ; 231a, 231b) sont configurés pour définir un chemin de guidage, de déviation et de retour, pour amener ledit fil (11), sortant du premier passage (F1) dans la zone de traitement (15), à achever au moins un deuxième passage (F2) dans la zone de traitement (15) dans la même direction que le premier passage (F1), ledit

deuxième passage (F2) étant dans la même direction que ledit premier passage (F1), le dispositif comprenant également un moyen pour commander et ajuster la tension du fil (11) disposé dans au moins un point du chemin de déviation, de guidage et de retour, entre le premier passage (F1) et le deuxième passage (F2).

5

de nettoyage (49) associé au moins à un desdits cylindres de guidage et/ou de déviation (29, 23, 24, 31 et 32 ; 124, 131 ; 231a, 231b).

12. Dispositif selon la revendication 11, **caractérisé en ce que** ledit moyen pour commander et ajuster la tension du fil (11) comprend un cylindre d'enroulement motorisé (38) disposé en aval de la machine de flambage (12) et duquel le fil (11) sortant de l'au moins un deuxième passage (F2) est attiré, et au moins un cylindre de guidage et/ou de déviation (29, 23, 24, 31 et 32 ; 124, 131 ; 231a, 231b) disposé en aval de la machine de flambage (12) et sur lequel s'enroule le fil (11) sortant du premier passage (F1). 10
13. Dispositif selon la revendication 12, **caractérisé en ce qu'**au moins un desdits guides et/ou cylindres de déviation (29, 23, 24, 31 et 32 ; 124, 131 ; 231a, 231b) est motorisé. 15
14. Dispositif selon la revendication 12 ou 13, **caractérisé en ce que** ledit moyen pour commander et ajuster la tension du fil (11) comprend également au moins un capteur (40) de tension disposé le long du chemin du fil (11) et une unité de commande (64), dans lequel ladite unité de commande (64) est configurée pour recevoir au moins la valeur de la tension du fil (11) provenant dudit au moins un capteur (40) de tension et pour agir sur l'entraînement dudit cylindre d'enroulement (38) et/ou d'au moins un desdits guides et/ou cylindres de déviation (29, 23, 24, 31 et 32 ; 124, 131 ; 231a, 231b) afin de maintenir ou de ramener la tension à une valeur souhaitée. 20
15. Dispositif selon la revendication 14, **caractérisé en ce que** ladite unité de commande est configurée pour maintenir la vitesse d'attraction de fil périphérique du au moins un guide et/ou cylindre de déviation motorisé (29, 23, 24, 31 et 32 ; 124, 131 ; 231a, 231b) à une valeur supérieure d'au moins 5 %, avantageusement d'au moins 10 %, par rapport à la vitesse périphérique du cylindre d'enroulement (38). 25
16. Dispositif selon l'une quelconque des revendications 10 à 14, **caractérisé en ce qu'**un dispositif de déplacement (50) relie ledit dispositif (10) à ladite machine de flambage (12) et comprend un actionneur (51), approprié pour déplacer ledit dispositif (10) par rapport à ladite machine de flambage (12), afin d'extraire et d'insérer sélectivement ledit fil (11) de/dans ladite zone de traitement (15). 30
17. Dispositif selon l'une quelconque des revendications 12 à 16, **caractérisé en ce qu'**il comprend un moyen 35

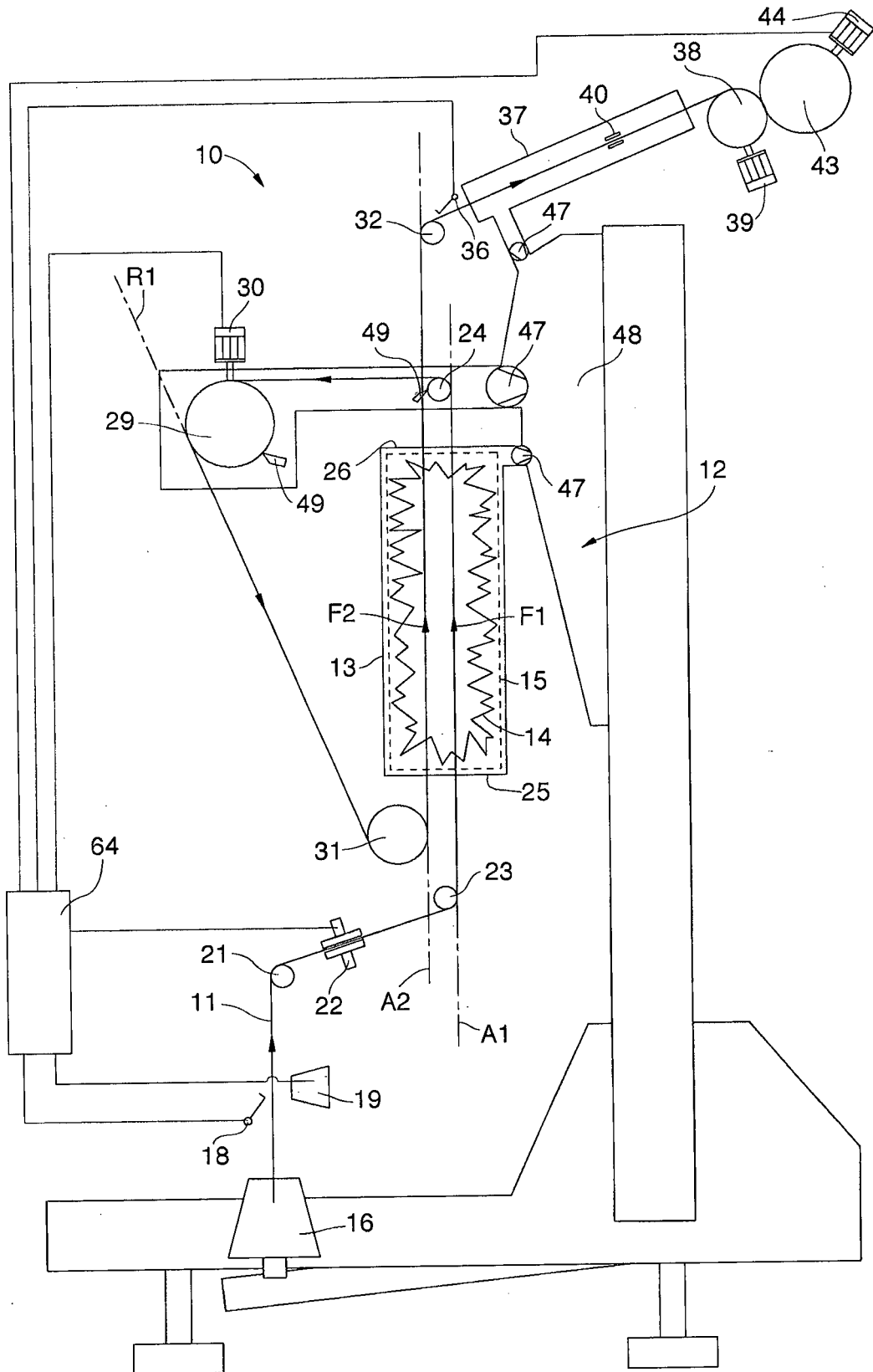


fig.1

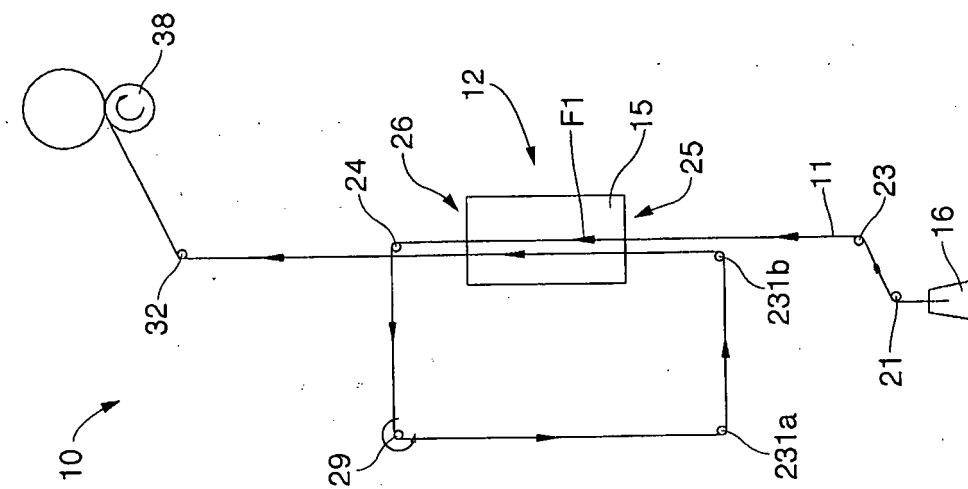


fig. 3

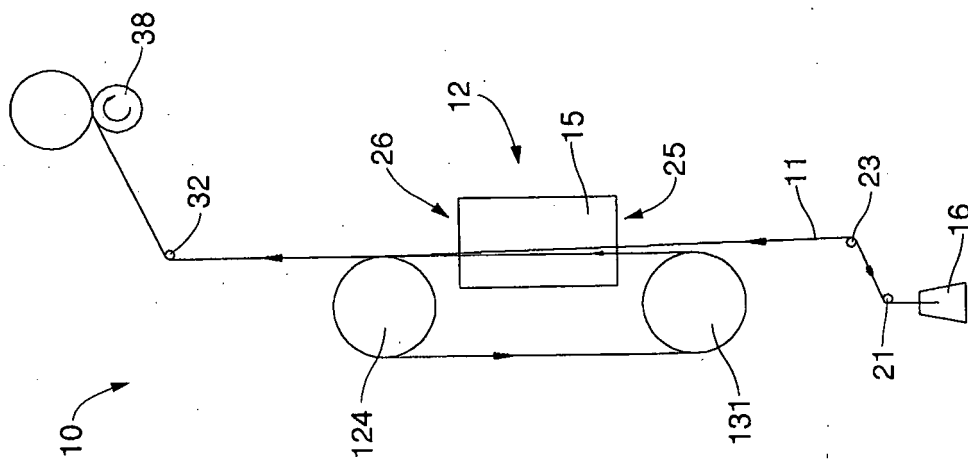


fig. 2

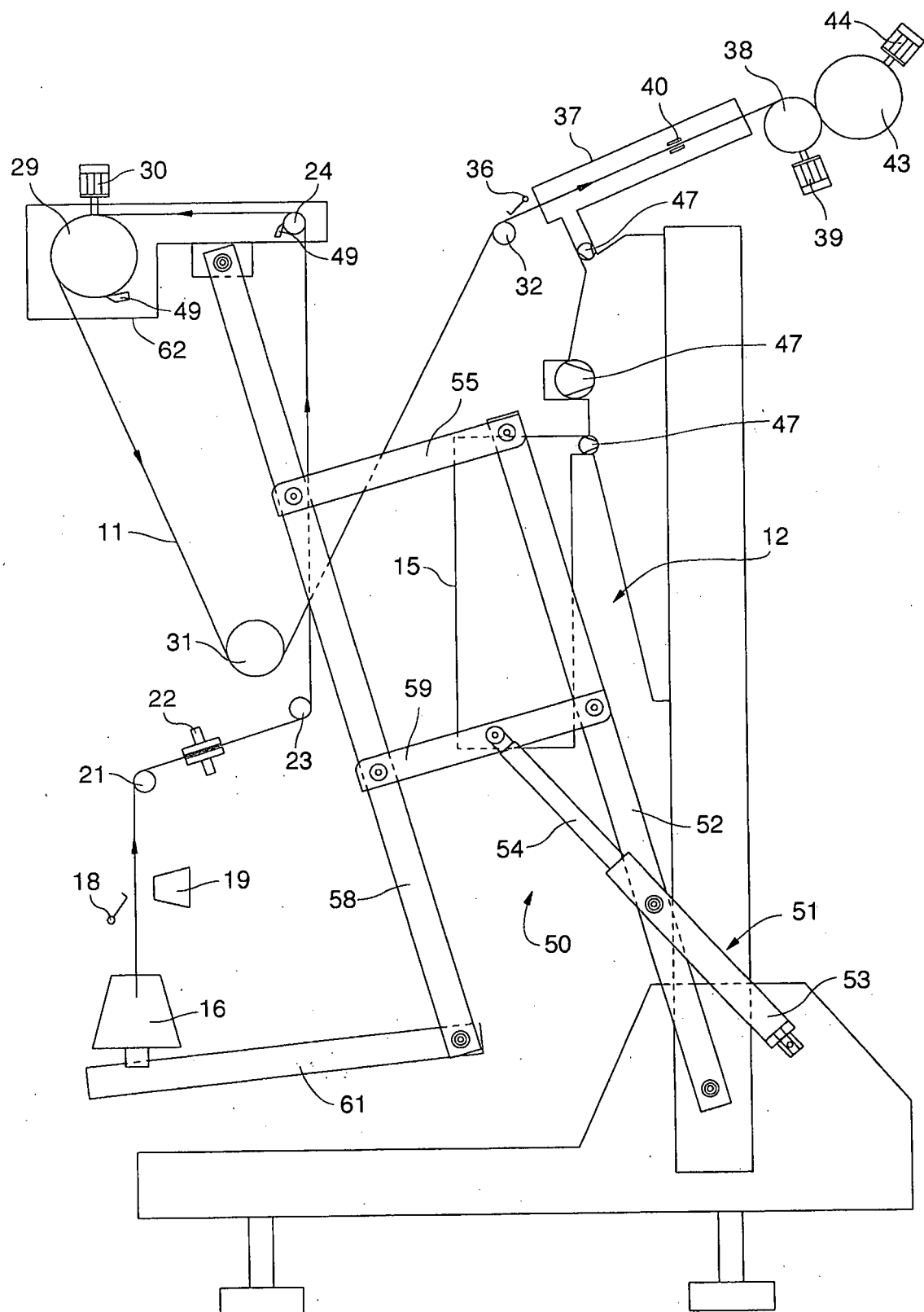


fig. 4

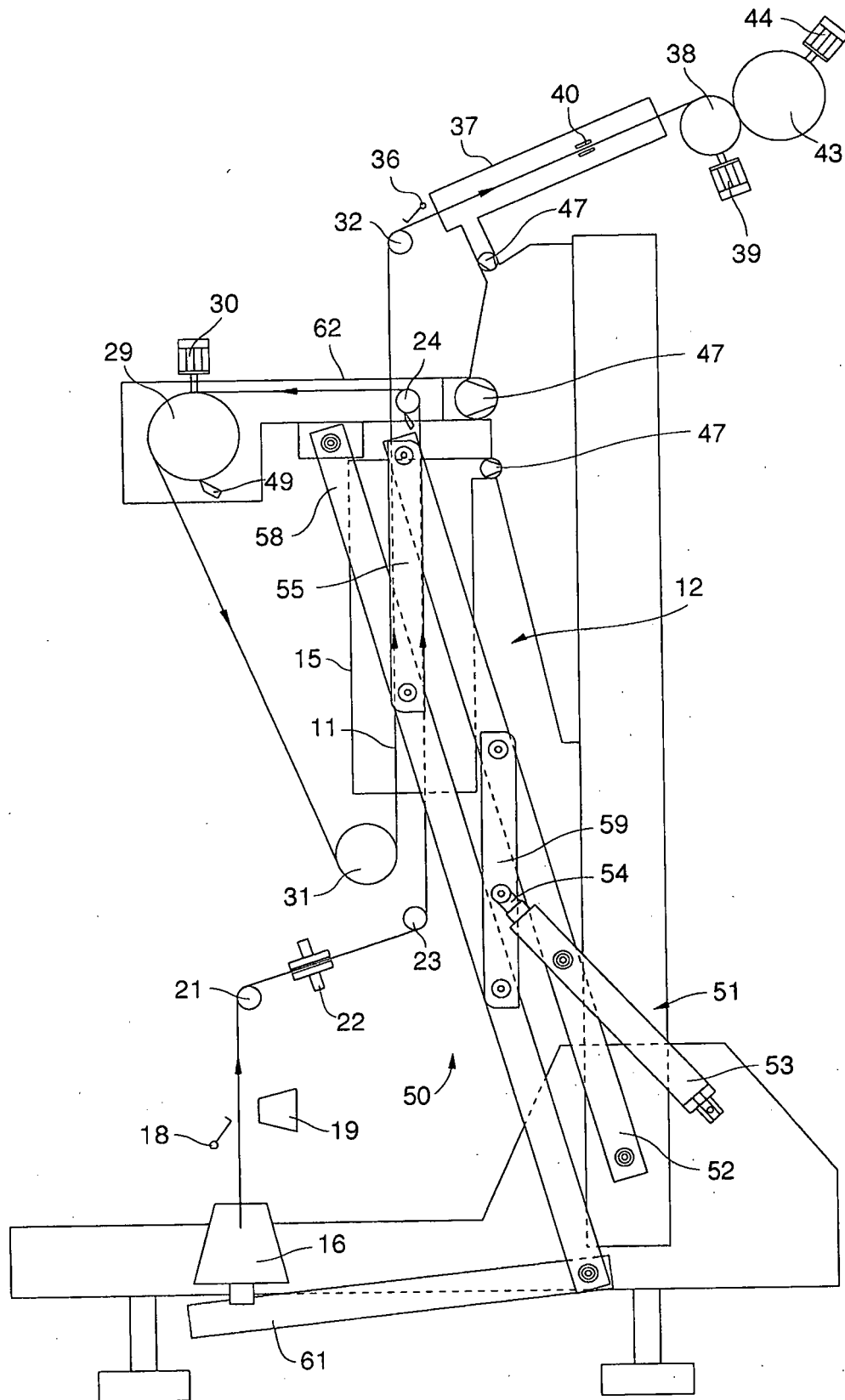


fig. 5

REFERENCES CITED IN THE DESCRIPTION

This list of references cited by the applicant is for the reader's convenience only. It does not form part of the European patent document. Even though great care has been taken in compiling the references, errors or omissions cannot be excluded and the EPO disclaims all liability in this regard.

Patent documents cited in the description

- US 6151764 A [0010]
- JP 6264323 A [0010]
- GB 10198 A [0010]