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(54) **APPARATUS AND METHOD FOR FINISHING A TEXTILE**

(57) An apparatus for finishing a textile material, comprises at least two rotating grinding rollers (25, 26), disposed facing each other with the respective axes (A1,

A2) parallel to each other and transverse with respect to the direction of feed of the textile material. The grinding rollers (25, 26) are also mobile axially.

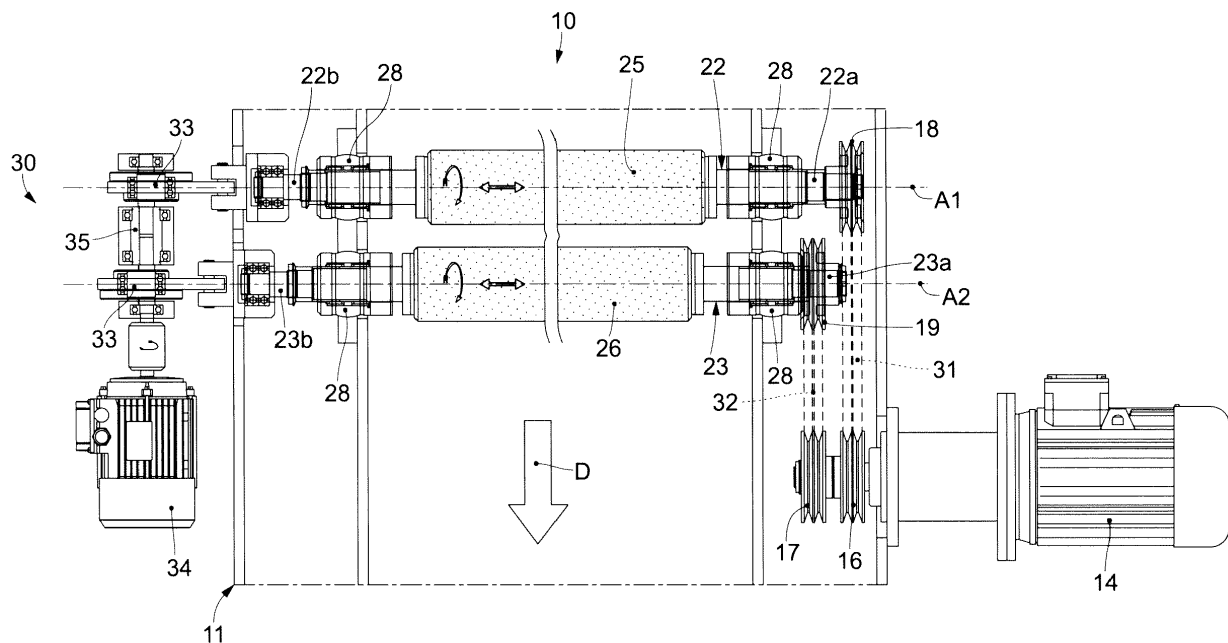


fig. 1

Description

FIELD OF THE INVENTION

[0001] The present invention concerns an apparatus and a method for finishing textile material. In particular, the finishing operation to which the present invention refers is that of grinding textiles, even if it is not excluded that the invention can be applied to other treatments similar or comparable to grinding.

BACKGROUND OF THE INVENTION

[0002] The treatment of grinding fabrics consists in raising the short down of a textile material to obtain an effect similar to that present on the skin of a peach, and to make the ground textile material softer.

[0003] Known grinding apparatuses normally consist of abrasive brushes or rotating rollers or cylinders, covered on their external surface with slightly abrasive paper which, by scraping the surface of the textile material, produces a more or less evident effect depending on the working parameters set.

[0004] If the textile material intrinsically has defects, they are inevitably accentuated as a result of this processing. The same thing happens if a defect is present in one or more components of the grinding apparatus, in particular those in direct contact with the textile material, which consequently replicate this defect on the textile material itself.

[0005] For this reason, in some grinding apparatuses, a device called a "to and fro device" is provided which acts on the grinding roller, moving it linearly along its axis during the passage of the textile material; the purpose of this displacement is to attenuate/eliminate/equalize any defects on the textile material (intrinsic or deriving from the processing) as well as to preserve the components of the apparatus itself.

[0006] The "to and fro" device of the known type induces a slow oscillatory movement on the roller on which it operates and this movement, as we said, takes place in a transverse direction with respect to the direction of feed of the textile material.

[0007] The "to and fro" device can be applied in processes of selvaging, grinding with abrasive paper, grinding with brushes and in metal or vegetable teasing.

[0008] As far as grinding is specifically concerned, it is known that the speed of rotation of the grinding roller cannot be considerably increased since, by doing so, the aggressiveness of the action would become such as to create damage to the textile material.

[0009] It is also known that the influence of the "to and fro" motion in a rotating roller can create phenomena of imbalance and vibration that can also affect the structure of the entire grinding apparatus.

[0010] Furthermore, with the current state of the art, known grinding apparatuses grind only the weft threads, that is, the threads transverse to the direction of feed of

the textile material, and not the warp threads.

[0011] It is also known that a possible increase in the speed of the "to and fro" device, in order to create the desired grinding effect on the warp threads as well, would trigger unmanageable vibrations which would compromise the stability of the machine, as well as the effectiveness of the treatment.

[0012] A first purpose of the invention is therefore to provide a grinding apparatus which is able to grind both the weft threads and the warp threads, that is the parallel threads with respect to the direction of feed of the textile material, obtaining an effective and innovative grinding effect.

[0013] A second purpose of the present invention is to provide a grinding apparatus able to achieve the desired grinding effect without increasing either the pressure exerted by the abrasive material, or the speed of rotation of the grinding rollers, or the ratio between the speed of rotation and the speed of feed of the textile material, especially if there are valuable and/or sensitive textile materials present.

[0014] Another purpose of the present invention is to provide a grinding apparatus able to obtain a desired finishing level by acting on each occasion, and depending on the desired result, on the peripheral speed, on the axial displacement speed, on the pressure and on the particle sizes of the abrasive elements.

[0015] Another purpose of the present invention is to provide a method for grinding textile materials for the functioning of the grinding apparatus which overcomes the limits of the state of the art.

[0016] 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

[0017] The present invention is set forth and characterized in the independent claims, while the dependent claims describe other characteristics of the invention or variants to the main inventive idea.

[0018] In accordance with the above purposes, an apparatus for finishing a textile material, according to the present invention, comprises at least two rotating grinding rollers, disposed facing each other with their respective axes parallel to each other and transverse with respect to the direction of feed of the textile material.

[0019] According to the invention, the two rotating grinding rollers are also mobile axially, synchronously but in reciprocal phase opposition.

[0020] In this way, even if they are moved axially at high speed, in order to make the desired grinding effect on the warp threads as well, the phase opposition of their movements means that the vibrations induced on the structure of the machine to are compensated and substantially eliminated, thus making it possible to obtain the desired treatment without triggering disadvantageous

phenomena.

[0021] According to a first embodiment, the two rollers are made to rotate by the same motor, or by two separate motors, by means of respective transmission systems, for example of the pulley and transmission belt type, in which means are also provided to obtain the phase opposition of the respective axial movements.

[0022] In one solution, the means to obtain the axial movement in phase opposition provide a motor associated with eccentric shafts to transmit the motion, each associated with a respective grinding roller.

[0023] In a variant, said means to obtain the phase opposition of the axial movements comprise distinct drives, one for each roller, suitably synchronized with each other to determine the alternate axial movement of the grinding rollers.

[0024] According to other variants which are also possible, the abrasive rollers are moved axially by respective pneumatic or hydraulic cylinders, by linear actuators or by other drives of a type known in the state of the art, which are also suitably synchronized to obtain the movement in phase opposition.

[0025] According to another possible embodiment, the grinding rollers rotate in the same direction and at the same speed of rotation.

[0026] According to a variant embodiment, the grinding rollers rotate at at least slightly different speeds.

[0027] According to other solutions, the grinding rollers can rotate in the same direction, or in reciprocally opposite directions.

[0028] There are solutions within the scope of the invention in which the abrasive element, for example paper, mounted on a grinding roller is the same as, or different from the abrasive element mounted on the other grinding roller.

[0029] It is also within the scope of the invention that the apparatus comprises more than two associated rollers, advantageously in an even number for the purpose of obtaining an easy compensation of the vibrations induced by the axial movement thanks to the phase opposition, in twos, of their movements.

[0030] According to the invention the variants provided allow, on each occasion, in their combination, to adapt the range of textiles which can be ground and consequently to set various grinding results according to a wide range of different textile materials.

[0031] A method for finishing a textile material, by means of the present finishing apparatus, comprises:

- providing two rotating grinding rollers with the respective axes of rotation parallel to each other and transverse to the direction of feed of the textile material;
- moving said grinding rollers axially at high speed and in phase opposition.

BRIEF DESCRIPTION OF THE DRAWINGS

[0032] These and other aspects, characteristics and advantages of the present invention will become apparent from the following description of some embodiments, given as a non-restrictive example with reference to the attached drawings wherein:

- fig. 1 shows a grinding apparatus according to a first embodiment of the present invention;
- fig. 2 shows a grinding apparatus according to a second embodiment of the present invention;
- fig. 3 shows a grinding apparatus according to a third embodiment of the present invention.

[0033] To facilitate comprehension, the same reference numbers have been used, where possible, to identify identical common elements in the drawings. It is understood that elements and characteristics of one embodiment can conveniently be incorporated into other embodiments without further clarifications.

DETAILED DESCRIPTION OF SOME EMBODIMENTS

[0034] We will now refer in detail to the various embodiments of the present invention, of which one or more examples are shown in the attached drawings. Each example is supplied by way of illustration of the invention and shall not be understood as a limitation thereof.

[0035] With reference to the drawings, in particular figs. 1 to 3, the present invention concerns a grinding apparatus 10 for textile materials.

[0036] The grinding apparatus 10 comprises, in the case shown here, two rotating grinding rollers, respectively 25 and 26, disposed with the respective axes of rotation A1 and A2 parallel to each other and transverse to the direction of feed of the textile material, which is made to pass, in a direction D, in contact with the surfaces of the grinding rollers 25, 26.

[0037] To make the grinding rollers 25 and 26 rotate, the solution of figs. 1 and 2 provides a single motor member 14 on whose exit shaft two drive pulleys 16, 17 are mounted.

[0038] In the solution of fig. 3, the grinding apparatus 10 comprises two motor members 14a, 14b, which are configured to drive the drive pulley 16 and the drive pulley 17 respectively.

[0039] The grinding apparatus 10 also comprises transmission belts 31, 32 which connect the drive pulleys 16, 17 of the one or of each motor member 14, 14a, 14b with driven pulleys 18, 19.

[0040] The driven pulleys 18, 19, connecting to respective first ends 22a and 23a, make respective shafts 22, 23 rotate, on which the grinding rollers 25, 26 are mounted. The shafts 22, 23 also have second ends 22b and 23b, opposite the first ends 22a and 23a.

[0041] The grinding rollers 25, 26 have an abrasive material on their external surface, for example slightly

abrasive paper, abrasive filaments, abrasive surface deposits, which by acting on the textile material during its passage on the grinding rollers 25, 26 allow to perform the grinding treatment.

[0042] The particle size of the abrasive material can vary, on each occasion, depending on the type of textile material and depending on the grinding result to be obtained for that particular type of textile material.

[0043] According to the invention, the grinding apparatus 10 comprises a support structure 11. Bearings 28 are provided on the support structure 11, provided near each end 22a, 22b and 23a, 23b of each shaft 22, 23.

[0044] The bearings 28 are configured to support the rotation of the grinding rollers 25, 26.

[0045] According to the present invention, the grinding apparatus 10 comprises movement means 30 to move the grinding rollers 25 and 26 along their respective axes A1 and A2. In particular, the axial movement means 30 are configured to move axially, even at high speeds, the grinding rollers 25, 26 in reciprocal phase opposition, with a synchronized and respectively alternate "to and fro" movement.

[0046] In accordance with a first possible embodiment, shown by way of example in fig. 1, the axial movement means 30 comprise a motor member 34 connected to respective eccentric command shafts 33.

[0047] The eccentric command shafts 33 are in turn associated with the respective second ends 22b and 23b of each shaft 22 and 23, to transform the rotary motion of the motor member 34 into a rectilinear, high speed to and fro movement of the respective grinding rollers 25 and 26.

[0048] The two eccentric command shafts 33 can be connected to each other by means of a motion transmission joint 35.

[0049] By suitably offsetting the eccentric command shafts 33 with respect to one another, it is possible to determine the phase opposition of the rectilinear movement of the grinding rollers 25, 26, thus obtaining the desired effect.

[0050] In this way, in fact, the grinding rollers 25, 26 determine the grinding treatment also on the warp threads of the textile material, without however generating undesired vibrations, oscillations and imbalances on the structure of the apparatus 10, which are compensated due to the opposite linear movement of the grinding cylinders 25, 26.

[0051] In accordance with a second possible embodiment, shown by way of example in fig. 2, the axial movement means 30 comprise linear actuators 36, for example of the electric type.

[0052] In particular, two linear actuators 36 are provided, each connected respectively to the second end 22b of the shaft 22 and to the second end 23b of the shaft 23.

[0053] In accordance with a third embodiment, shown by way of example in fig. 3, the axial movement means 30 comprise jacks 38, for example of the pneumatic or hydraulic type.

[0054] In particular, two jacks 38 are provided, each connected respectively to the second end 22b of the shaft 22 and to the second end 23b of the shaft 23.

[0055] In these two solutions, a control system determines the synchronized drive but in phase opposition of the linear actuators 36, or of the jacks 38, to obtain the out-of-phase linear movement of the grinding rollers 25 and 26.

[0056] According to possible variants, the axial movement means 30 can also comprise two separate motor members 34 acting in phase opposition to provide an axial moment to the grinding rollers 25, to be able to balance the oscillations of the entire grinding apparatus 10.

[0057] It is understood that the axial movement means 30 can comprise any other suitable device able to balance the oscillations generated by the axial rotation of the grinding rollers 25, 26.

[0058] According to one aspect of the present invention, the axial movement means 30 can be associated with a control and command unit configured to adjust the axial moment conferred on the grinding rollers 25, 26, so as to guarantee that the synchronism and phase opposition are maintained during the entire treatment step. The control and command unit can intervene to modify the axial displacement speed depending on the type of textile material to be treated and the final effect to be obtained.

[0059] The use of the axial movement means 30 configured as described above allows to balance the oscillations generated by the axial movement of the grinding rollers 25, 26 and therefore to reduce and even eliminate the vibrations and imbalances of the entire grinding apparatus 10.

[0060] Consequently it is possible to move the grinding cylinders 25 and 26 axially at an extremely high speed, with advantageous effects on the grinding treatment of the warp threads as well, and with advantages in terms of productivity.

[0061] It is clear that modifications and/or additions of parts may be made to the grinding apparatus and method as described heretofore, without departing from the field and scope of the present invention.

[0062] It is also clear that, although the present invention has been described with reference to some specific examples, a person of skill in the art shall certainly be able to achieve many other equivalent forms of grinding apparatus and method, having the characteristics as set forth in the claims and hence all coming within the field of protection defined thereby.

[0063] In the following claims, the sole purpose of the references in brackets is to facilitate reading: they must not be considered as restrictive factors with regard to the field of protection claimed in the specific claims.

Claims

1. Apparatus for finishing a textile material comprising

at least two rotating grinding rollers (25, 26), disposed facing with the respective axes (A1, A2) parallel to each other and transverse with respect to the direction of feed of the textile material, **characterized in that** said grinding rollers (25, 26) are also mobile axially, synchronously but in reciprocal phase opposition.

2. Apparatus for finishing a textile material as in claim 1, **characterized in that** it comprises axial movement means (30) associated with said grinding rollers (25, 26) and configured to axially move said grinding rollers (25, 26), synchronously but in reciprocal phase opposition.

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3. Apparatus for finishing a textile material as in claim 2, **characterized in that** said axial movement means (30) provide a motor (34) associated with respective eccentric shafts (33) to transmit the motion, each associated with a respective grinding roller (25, 26).

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4. Apparatus for finishing a textile material as in claim 2, **characterized in that** said axial movement means (30) comprise distinct drives, one for each grinding roller (25, 26), suitably synchronized with each other to determine the alternate axial movement of the grinding rollers (25, 26).

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5. Apparatus for finishing a textile material as in claim 4, **characterized in that** said distinct drives comprise linear actuators (36) of the electric type.

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6. Apparatus for finishing textile material as in claim 2, **characterized in that** said distinct drives comprise pneumatic or hydraulic jacks (38).

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7. Apparatus for finishing a textile material as in any claim hereinbefore, **characterized in that** it comprises a command and control unit connected at least to said axial movement means to adjust the axial moment conferred on said grinding rollers (25, 26).

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8. Method for finishing a textile material (12), comprising:

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 - providing two rotating grinding rollers (25, 26) rotating with their respective axes of rotation (A1, A2) parallel to each other and transverse to the direction of feed of the textile material;

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 - moving said grinding rollers (25, 26) axially at high speed and in reciprocal phase opposition.

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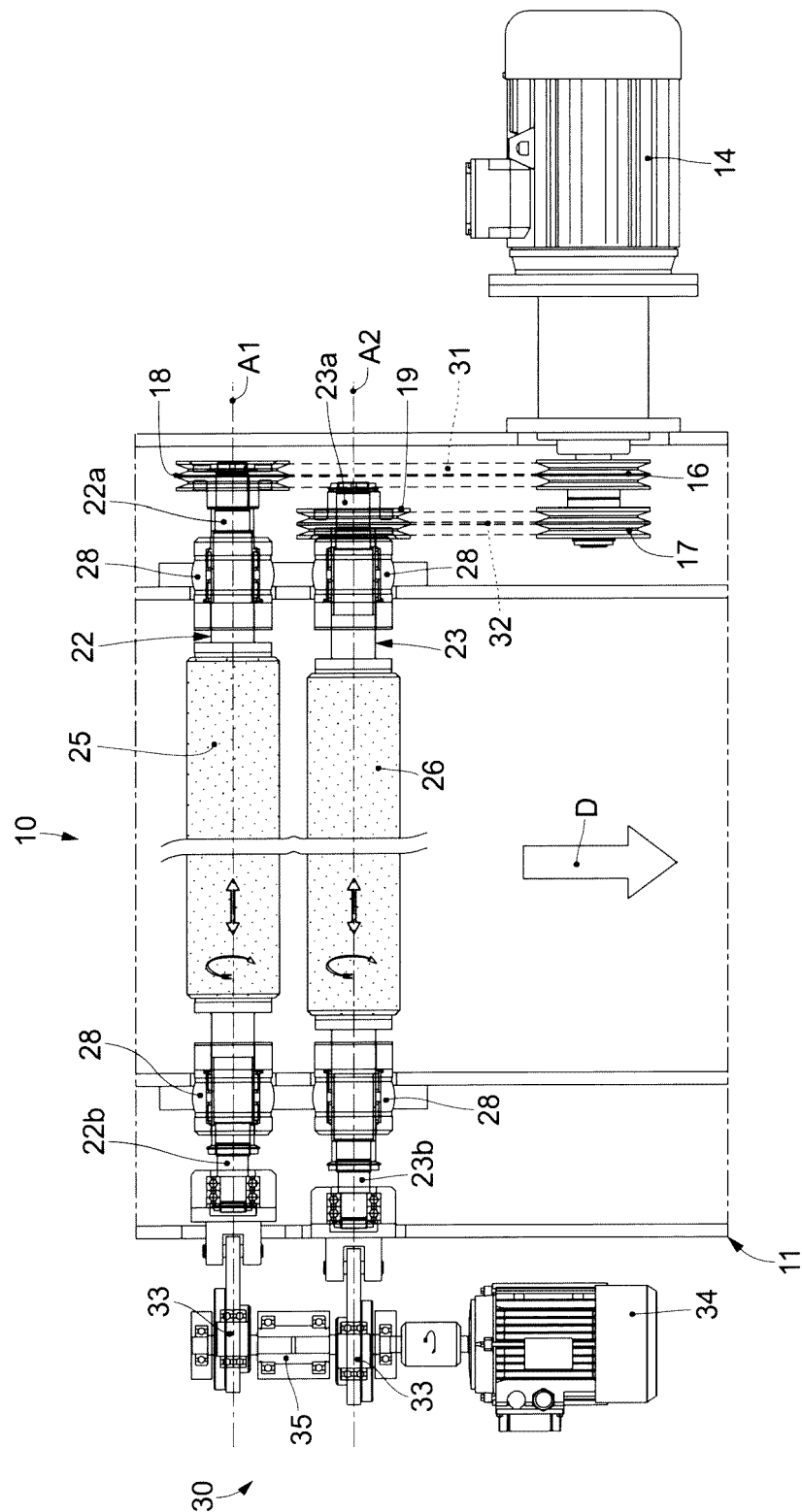


fig. 1

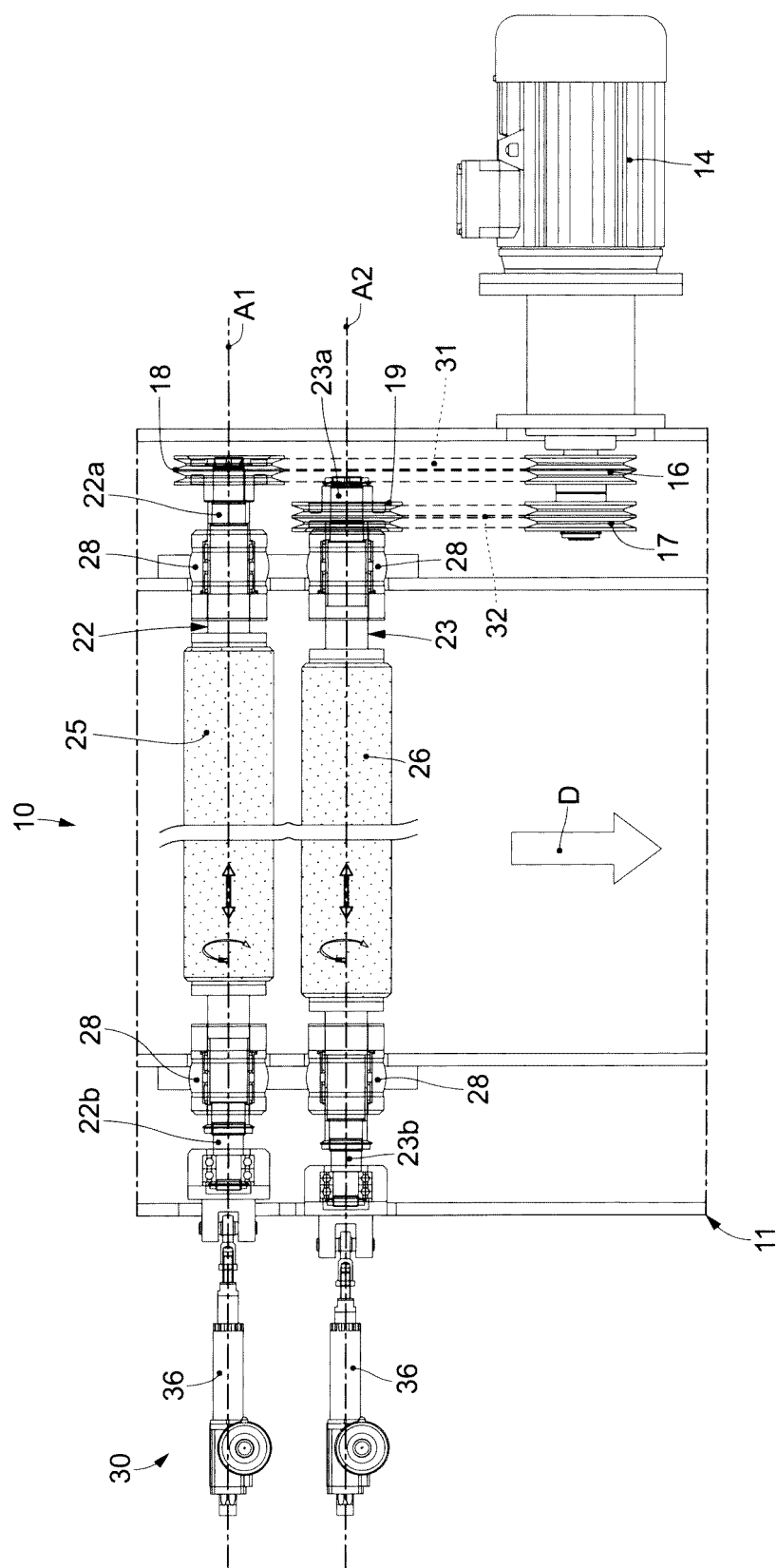
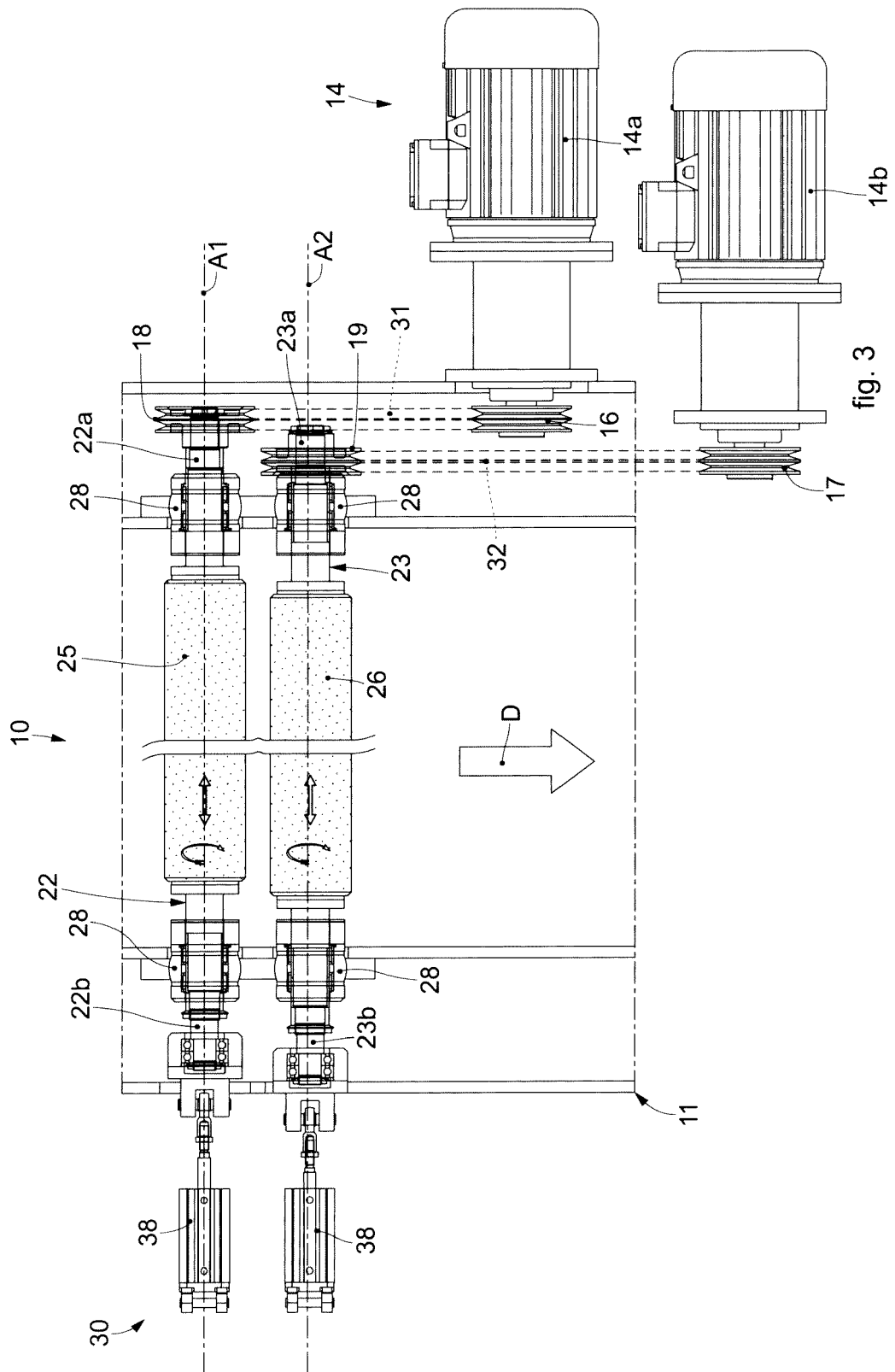


fig. 2





EUROPEAN SEARCH REPORT

Application Number
EP 19 42 5021

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EPO FORM 1503 03.82 (P04C01)

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X	WO 99/06624 A1 (FRANCHETTI ROBERTO [IT]) 11 February 1999 (1999-02-11)	1,2,4-8	INV. D06C11/00
Y	* page 6, lines 23-25; figures 1,2,3a-3d * * page 7, lines 12-18 * * page 8, lines 3-6,19-24; figure 4 * * page 9, lines 31,32 * * page 10, lines 12-33 * * page 11, lines 1-8 *	3,7	
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The present search report has been drawn up for all claims			
Place of search Munich		Date of completion of the search 5 September 2019	Examiner Uhlig, Robert
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			

**ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.**

EP 19 42 5021

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