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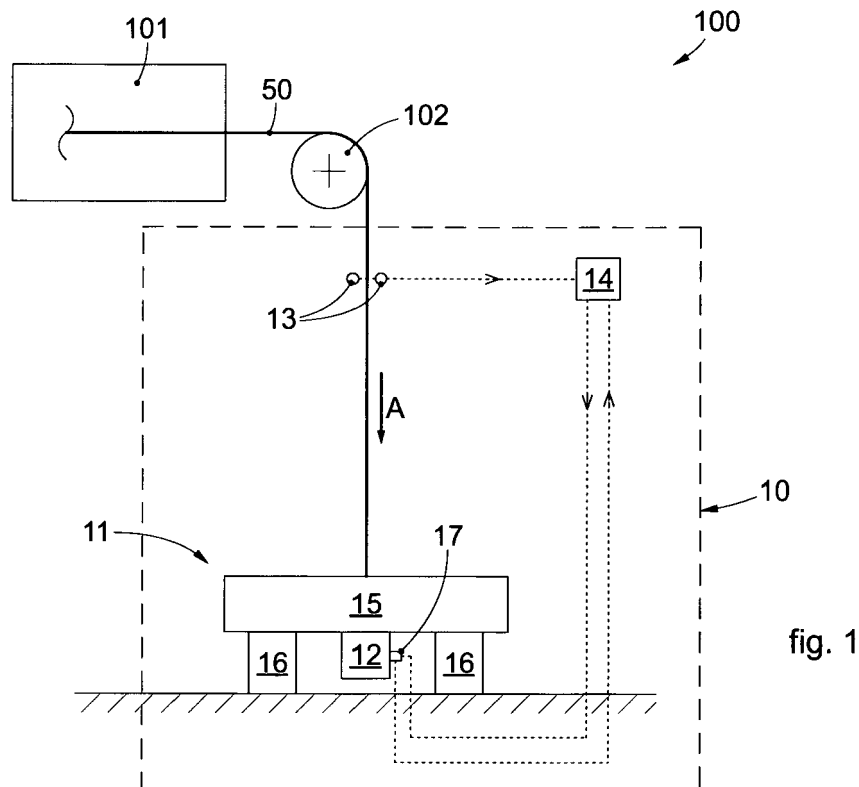
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(54) **PROCESSING MACHINE FOR TEXTILE PRODUCTS AND RELATED CENTERING APPARATUS AND METHOD**

(57) The present invention concerns an apparatus (10) for centering textile products (50) and a machine (100) for processing textile products (50) comprising one or more processing apparatuses (101), at least one trans-

port element (102) and at least one centering apparatus (10) as above. The present invention also concerns a centering method able to be implemented by means of the apparatus (10) for centering textile products (50).



Description

FIELD OF THE INVENTION

[0001] The present invention concerns a machine for processing textile products, as well as the corresponding centering apparatus and method. The invention is used for the correct positioning of the textile product in determinate points at the entry or exit to/from the processing machines in order to ensure the success of the subsequent processing.

[0002] In particular, but not exclusively, the invention concerns textile machines which work in batch mode, with storage in motion in which the textile product is moved back and forth for suitable periods of time.

BACKGROUND OF THE INVENTION

[0003] In this document, reference will be made to the term fabric or textile product, to indicate both fabric and non-woven fabric. Similarly, "piece" means a piece of fabric or non-woven fabric.

[0004] Textile processing machines are known, comprising centering apparatuses, such as fabric guides with slats, cylinders or suchlike, used to position a piece being processed in determinate positions at the inlet or outlet of the machines in order to ensure the success of the subsequent processing.

[0005] To determine the position of the piece, it is provided to detect the edge (or height) of the fabric by means of optical sensors, such as photocells and/or barriers, or mechanical sensors or suchlike, which can be installed upstream and/or downstream of the centering apparatus.

[0006] In known solutions, the centering is managed by physically acting on the fabric, by means of its lateral displacement.

[0007] One disadvantage of these solutions is that the possible lateral displacement of the fabric is limited, normally not more than 8-10 cm, thus not allowing to correct all possible situations.

[0008] Furthermore, the prerogative to control the fabric well is to keep it slightly under tension. In some processes, such as for example dyeing or free steaming, it is not expected/possible to keep the fabric taut.

[0009] In particular, in machines that work in batches it becomes more difficult to control the fabric, especially if it is working in free mode. In fact, with the continuous back and forth movement of the fabric in the machine there may be lateral displacements of the fabric due to fabric construction errors/defects, for example one selvage more taut than the other, or to external processing factors, such as air, water and suchlike, which can trigger more or less evident deviations.

[0010] In addition, in the case of short stretches of fabric, before and/or after the centering device, and the need for "high" movements, the creation of creases on the fabric is inevitable, which inevitably generate defects in subsequent processing. It should be noted that having very

long stretches of "free" fabrics before and/or after the centering device is a condition that is rarely possible in textile machines.

[0011] The formation of creases in the fabric can lead to defects, for example the presence of a crease may not allow correct washing in order to completely eliminate impurities, such as sizing substances, textile oils, corrosive chemical compounds or dirt, also resulting from previous processes, and the correct and homogeneous distribution of the dyes on the fabric.

[0012] There is therefore a need to perfect and make available a centering apparatus which overcomes at least one of the disadvantages of the state of the art. There is also a need to perfect and make available a centering method and a textile processing machine which overcome at least one of the disadvantages of the state of the art.

[0013] The purpose of the present invention is to provide a centering apparatus which allows to control the centering of the fabric without physically acting on it.

[0014] Another purpose is to allow a very precise centering of the fabric throughout the processing step, even in the processes in which the fabric is not kept under tension.

[0015] Another purpose is not to have any limitations on movement, without also creating creases or defects in the fabric.

[0016] In particular, one purpose is to optimize the control of the displacement of the fabric in all the machines that work in the back-forth mode with the fabric free, typically in batches.

[0017] 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

[0018] The present invention is set forth and characterized in the independent claims. The dependent claims describe other characteristics of the present invention or variants to the main inventive idea.

[0019] In accordance with some embodiments of the invention, the machine for processing fabrics comprises one or more processing apparatuses, at least one element for transporting the fabric in a direction of advance, and at least one centering apparatus.

[0020] According to one aspect, the apparatus for centering a fabric as above comprises:

- an element for supporting the fabric, mobile at least in a direction transverse to the direction of advance of the fabric;
- a member for driving the support element;
- at least one element for detecting the position of the fabric;
- a unit for controlling the movement of the support element, configured to receive from the detection el-

ement signals relating to the position of the fabric with respect to the transport element, and to command the drive member a movement of the support element so that the fabric is positioned in correspondence with a desired position with respect to the support element.

[0021] Advantageously, by moving the support element, rather than the fabric, in the transverse direction, it is possible to reduce or even prevent the formation of creases.

[0022] It is also possible to resolve situations in which the required displacement of the fabric is large, for example greater than 10 cm.

[0023] Advantageously, an appropriate management of the speed of movement of the support element can allow to have very rapid response times in the positioning, making it possible to easily treat also fabrics with short free segments before the centering apparatus.

[0024] Furthermore, since the displacement of the fabric is not required, it is possible to prevent damaging it, for example in the case of very delicate fabrics, or avoid coming into contact with substances used to treat it, such as dyes or chemical treatment elements, preventing stains or smudges or suchlike.

[0025] Formulations of the present invention also concern a centering method which can be executed by means of a centering apparatus of a machine for processing fabrics as described above.

ILLUSTRATION OF THE DRAWINGS

[0026] 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 is a schematic representation of a lateral view of a textile processing machine comprising a centering apparatus according to an embodiment described here;
- fig. 2 is a schematic representation of a front view of the machine for processing fabrics of fig. 1 in an initial step of the processing, according to some embodiments described here;
- figs. from 3 to 5 are schematic representations of a front view of the machine for processing fabrics of fig. 1, with the fabric respectively centered, off-centered to the left and off-centered to the right with respect to a transport element according to some embodiments described here;
- fig. 6 is a schematic representation of a lateral view of a machine for processing fabrics in batch mode according to an example embodiment described here.

[0027] To facilitate comprehension, the same refer-

ence 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.

DESCRIPTION OF EMBODIMENTS

[0028] We will now refer in detail to the possible embodiments of the invention, of which one or more examples are shown in the attached drawings, by way of a non-limiting example. The phraseology and terminology used here is also for the purposes of providing non-limiting examples.

[0029] Embodiments described here with reference to figs. from 1 to 6 concern a machine 100 for processing fabrics 50, suitable for textile processing such as carbonization in pieces, purging, washing, singeing, dyeing, enzyme treatment and other processes and/or combinations thereof.

[0030] Embodiments described here also concern an apparatus 10 for centering the fabric 50.

[0031] The processing machine 100 comprises one or more processing apparatuses 101 for the processes as above, at least one element 102 for transporting the fabric 50 and at least one apparatus 10 for centering the fabric 50.

[0032] In the present description, we will refer by way of example to a feed roller as the transport element 102, but in an equivalent manner the transport element 102 as above can be a transport system with air or water, or another type of mechanical element or suchlike.

[0033] The processing machine 100 can be able to feed the fabric 50 in a direction of advance A through the one or more processing apparatuses 101 and the at least one feed roller 102, up to a support mean 15 able to accommodate the fabric 50, from which the fabric 50 will be removed for the subsequent processing or sent to storage.

[0034] The centering apparatus 10 comprises an element 11 for supporting the fabric 50, a drive member 12, at least one element 13 for detecting the position of the fabric 50 and a unit 14 for controlling the movement of the support element 11.

[0035] According to some embodiments, the at least one feed roller 102 is able to guide the fabric 50 exiting the processing apparatus 101 in the direction of advance A in order to be positioned in correspondence with the support element 11. In a preferential form, the fabric 50 is positioned centrally with respect to the support element 11.

[0036] The support element 11 can comprise at least the support mean 15 able to accommodate the fabric 50 and at least one movement element 16.

[0037] The mean 15 for supporting the fabric 50 can be a containing tub or cradle, a support surface, a winding roller or suchlike.

[0038] The support element 11 is able to move, by

means of the at least one movement element 16, at least in a direction T1, T2 transverse to the direction of advance A of the fabric 50.

[0039] The movement element 16 can be selected from a group that includes wheels, rail systems, conveyor belts and suchlike.

[0040] The drive member 12 is able to drive the at least one movement element 16 of the support element 11, in particular and at least in the transverse direction T1 or T2.

[0041] The drive member 12 can comprise, for example, any suitable mechanical, electrical, hydraulic or pneumatic drive whatsoever, of the type known in the state of the art, such as an electric motor or actuator, a pneumatic cylinder, an electric cylinder, a gear motor or suchlike.

[0042] According to some embodiments, the centering apparatus 10 can also comprise one or more transduction devices 17, able to detect the position of the support element 11.

[0043] The transduction devices 17 can comprise direct, absolute or incremental position sensors, such as for example encoders, differential transformers, linear potentiometers or suchlike, or indirect transduction devices, such as for example devices that estimate the extent of the displacement based on measurements of current or voltage, or suchlike.

[0044] According to some embodiments, the detection element 13 is able to detect the position of the fabric 50 with respect to a plane X passing through the center of the feed roller 102 and perpendicular to its axis. Figs. 3-5 show, by way of example, various positions of the fabric 50 with respect to the feed roller 102: centered in fig. 3, off-centered to the left in fig. 4 and off-centered to the right in fig. 5.

[0045] The detection element 13 can comprise a position sensor installed upstream of the support element 11.

[0046] The sensor as above can preferably be of the contactless type, selected from a group comprising optical sensors or ultrasonic sensors. Alternatively, the detection element 13 can be a contact type sensor, such as a mechanical probe or suchlike.

[0047] The detection element 13 can also comprise a device for detecting the speed of the fabric, such as for example an ultrasonic speed sensor or an optical sensor or suchlike. In one variant, the position sensor and the speed sensor can be implemented in the same device, such as in a rotary probe.

[0048] According to another embodiment, the feed speed of the fabric 50 can be detected or calculated on the basis of parameters of the processing machine 100, for example on the basis of the rotation speed of the feed roller 102, or on the basis of the rotation speed, electrical parameters or other functioning parameters of other elements of the processing machine 100, such as other drawing rollers or belts or suchlike.

[0049] According to some embodiments, the unit 14 for controlling the movement of the support element 11 is configured to command a movement of the support

element 11 at least in one of the transverse directions T1, T2 so that the fabric 50 is positioned in correspondence with the desired position on the support element 11. Preferably, the control unit 14 is configured so that the fabric 50 is positioned in a centered position with respect to the support element 11.

[0050] The control unit 14 can comprise a processing unit, or CPU, and an electronic memory.

[0051] The control unit 14 can possibly also comprise a graphic interface, devices for interfacing with an operator, such as displays, a mouse, keyboards, printers, and/or wireless or wired communication systems, for communication with subsequent processing systems, external storage systems, cloud-based systems, databases and suchlike, such as modems, Bluetooth gates or signal cables or any other form of communication device whatsoever. It can possibly also comprise auxiliary circuits, such as circuits for interfacing with external power supply systems, automatic backup systems, and suchlike.

[0052] For example, the processing unit can be any form of computer processor whatsoever usable in the IT field to process data advantageously in the field of mechanical textiles and non-woven fabric.

[0053] The electronic memory can be connected to the processing unit and be, for example, a random access memory (RAM), a read only memory (ROM), a floppy disc, a hard disk, a mass storage memory, or any other form whatsoever of digital storage, local or remote.

[0054] The memory can be able to store one or more algorithms (or instructions, or program or computer software code) readable by the processing unit to implement the centering method according to this description.

[0055] The control unit 14 can be configured to detect signals sent by the detection element 13 relating to the position of the fabric 50 with respect to the feed roller 102.

[0056] Such control unit 14 can be configured to also detect signals sent by the detection element 13 relating to the speed of the fabric 50.

[0057] In particular, depending on the distance D between the reading level of the detection element 13 and the level at which the fabric is deposited on the support element 11 and the feed speed of the fabric, the control unit 14 can be configured to calculate the displacement times of the support element 11 so as to continuously guarantee a perfect positioning of the fabric with respect to the support element 11. By reading level of the detection element 13 we mean the level at which the one or more detection element(s) 13 is/are positioned with respect to the support element 11.

[0058] In an alternative embodiment, if the feed speed of the fabric is fixed and known a priori, the control unit 14 can be configured to calculate the displacement times of the support element 11 only based on the distance D.

[0059] According to some embodiments, the control unit 14 is configured to receive signals relating to the position of the support element 11 from the one or more transduction devices 17 and to define, by means of the

one or more algorithms as above and based on the signals relating to the position of the support element 11 and on the signals relating to the position and possibly the speed of the fabric 50, the extent of the movement of the support element 11 in the transverse direction T1, T2.

[0060] For example, the algorithm as above can be configured to calculate the center C1 of the fabric starting from the measured positions of the two ends E1, E2, or of the height H, of the fabric. It can therefore be configured to calculate the distance D1 between the center C1 of the fabric 50 and the center C2 of the support element 11. The desired position of the fabric in correspondence with the support element 11 can be, as a non-exclusive example, the center C2 of the support element 11 and/or of the support means 15.

[0061] The algorithm can finally be configured to define command parameters for the drive member 12 for moving the support element 11.

[0062] According to one variant embodiment, the control unit 14 is configured to also execute an algorithm for updating the position of the support element 11 and to calculate, on the basis of the updated position and of the signals relating to the position of the fabric 50, the extent of the movement of the support element 11 in the transverse direction T1, T2.

[0063] For example, the control unit 14 can store a position of the support element 11 and update it on the basis of some parameters of the drive member 12, such as the movement speed, the movement time, the amount of currents and voltages used for the movement and/or similar parameters.

[0064] In particular, and as shown in fig. 6, the centering apparatus 10 can be used in processing machines 100 in batch mode. In batch mode, the fabric is repeatedly moved between two support elements 11. With each passing, the fabric is processed by the processing apparatuses 101.

[0065] Advantageously, the positioning of the fabric 50 by means of the movement of the support element 11 prevents the displacement of the fabric, preventing the generation of creases and overlaps in the fabric 50 itself. Furthermore, interacting with the fabric by means of pliers, hooks or suchlike is also avoided, for example so as not to interact with the substances used for the processing, for example avoiding contact with the dyes which cause possible discoloration or smudging.

[0066] Some embodiments described here also concern a method to center the fabric 50.

[0067] The method can provide the following steps:

- detecting the position of the fabric 50, in particular of the two ends E1, E2 of the fabric 50, with respect to an element 102 for transporting the fabric 50;
- calculating the position of a support element 11 of an apparatus 10 for centering the fabric 50;
- calculating the distance D between the center C1 of the fabric 50 and the desired position of the fabric in

correspondence with the support element 11;

- calculating, based on the distance between the center C1 of the fabric 50 and the desired position of the fabric in correspondence with the support element 11, the extent of the movement of the support element 11 in the transverse direction T1, T2; and
- displacing the support element 11 into the desired position (fig. 2).

[0068] In particular, and as shown in fig. 2, the method can provide to detect and calculate the position of the center C1 of the fabric 50, based on the detection of the position of the ends E1 and E2 of the fabric 50.

[0069] It can therefore provide to calculate the distance D1 between the projection of the center C1 on the plane of the support element 11 and the center C2 of the support element 11.

[0070] Finally, it can calculate the extent of the movement of the support element 11 necessary for the center C1 of the fabric to be positioned in the desired position, once the plane of the support element 11 has been reached. For example, in a preferred embodiment in which the fabric 50 is centered with respect to the support element 11, the fabric 50 can be positioned so that the center C1 coincides with the center C2 of the support element 11. In an alternative embodiment, the center C1 can be positioned at a suitable distance from the center C2.

[0071] According to some embodiments, the method can provide to detect or calculate the speed of the fabric 50. It can therefore provide to also use the datum of the speed of the fabric 50 to calculate the extent of the movement of the support element 11 in the transverse direction T1, T2.

[0072] According to some embodiments, the method can provide to detect the position of the support element 11 by means of one or more transduction devices 17.

[0073] According to one variant, the method can provide to execute an algorithm for updating the position of the support element 11 in order to calculate its position.

[0074] It is clear that modifications and/or additions of parts or steps may be made to the centering apparatus 10, to the machine 100 for processing fabrics or non-woven fabrics 50 and to the centering method as described heretofore, without departing from the field and scope of the present invention as defined by the claims.

[0075] 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 (10) for centering a textile product (50) advancing in a direction of advance (A), **characterized in that** it comprises:

- an element (11) for supporting the textile product (50) mobile at least in a direction (T1, T2) transverse to the direction of advance (A) of the fabric or non-woven fabric (50) by means of a corresponding drive member (12);
 - at least one element (13) for detecting the position of the textile product (50);
 - a unit (14) for controlling the movement of said support element (11) configured to detect signals from said detection element (13), relating to the position of the textile product (50), and to command a movement of the support element (11) at least in one transverse direction (T1, T2), so that the textile product (50) is positioned in correspondence with a desired position of said support element (11).
2. Centering apparatus (10) as in claim 1, **characterized in that** said unit (14) for controlling the movement of said support element (11) is configured to command to said drive member (12) a movement in a transverse direction (T1, T2) of the support element (11) so that the textile product (50) is positioned in correspondence with a centered position with respect to the same support element (11).
 3. Centering apparatus (10) as in any claim from 1 to 2, **characterized in that** said support element (11) comprises at least one mean (15) for supporting the textile product (50) and at least one movement element (16).
 4. Centering apparatus (10) as in claim 3, **characterized in that** said drive member (12) is able to drive said at least one movement element (16) to move the support element (11) in one of the traverse directions (T1, T2).
 5. Centering apparatus (10) as in any claim from 1 to 4, **characterized in that** said detection element (13) is a sensor of the contactless type, selected from a group comprising optical sensors or ultrasonic sensors.
 6. Centering apparatus (10) as in any claim from 1 to 5, **characterized in that** it also comprises one or more transduction devices (17), able to detect the position of the support element (11).
 7. Centering apparatus (10) as in claim 6, **characterized in that** said control unit (14) is configured to also receive signals relating to the position of said support element (11) from said one or more transduction devices (17) and to define, on the basis of the signals relating to the position of said support element (11) and the signals relating to the position of the textile product (50), the extent of the movement of the support element (11) in the transverse direction (T1, T2).
 8. Centering apparatus (10) as in any claim from 1 to 7, **characterized in that** said control unit (14) is configured to execute an algorithm for updating the position of said support element (11) and for calculating, on the basis of said updated position and of the signals relating to the position of the textile product (50), the extent of the movement of the support element (11) in the transverse direction (T1, T2).
 9. Centering apparatus (10) as in any claim from 1 to 8, **characterized in that** said control unit (14) is configured to detect signals relating to the speed of the textile product (50), by means of a device for detecting the speed of the textile product (50) of the detection element (13).
 10. Processing machine (100) for textile products (50), comprising a centering apparatus (10) as in any claim from 1 to 9, and also one or more processing apparatuses (101) and at least one transport element (102) defining a direction of advance (A) of said textile product (50).
 11. Processing machine (100) as in claim 10, **characterized in that** a detection element (13) of said centering apparatus (10) is able to detect the position of the textile product (50) with respect to a plane (X) passing through the center of said transport element (102) and perpendicular to the axis of the transport element (102).
 12. Centering method for an apparatus (10) for centering the textile product (50), **characterized in that** it provides the steps of:
 - detecting the position of the textile product (50);
 - calculating the position of a support element (11) of the apparatus (10) for centering the textile product (50);
 - calculating the distance between the center (CI) of the textile product (50) and the desired position of the textile product (50) in correspondence with the support element (11);
 - calculating, on the basis of said distance between the center (CI) of the textile product (50) and said desired position of the textile product (50) in correspondence with the support element (11), the extent of the movement of the support element (11) in a transverse direction (T1, T2).
 13. Method as in claim 12, **characterized in that** it provides to detect or calculate the speed of the textile product (50) and to also use the datum of the speed of the textile product (50) to calculate the extent of the movement of the support element (11) in a transverse direction (T1, T2).

14. Method as in any claim from 12 to 13, **characterized in that**, in order to calculate the position of the support element (11), it provides to detect the position of said support element (11) by means of one or more transduction devices (17). 5
15. Method as in any claim from 12 to 13, **characterized in that** it provides to execute an algorithm for updating the position of the support element (11) in order to calculate the position of said support element (11). 10

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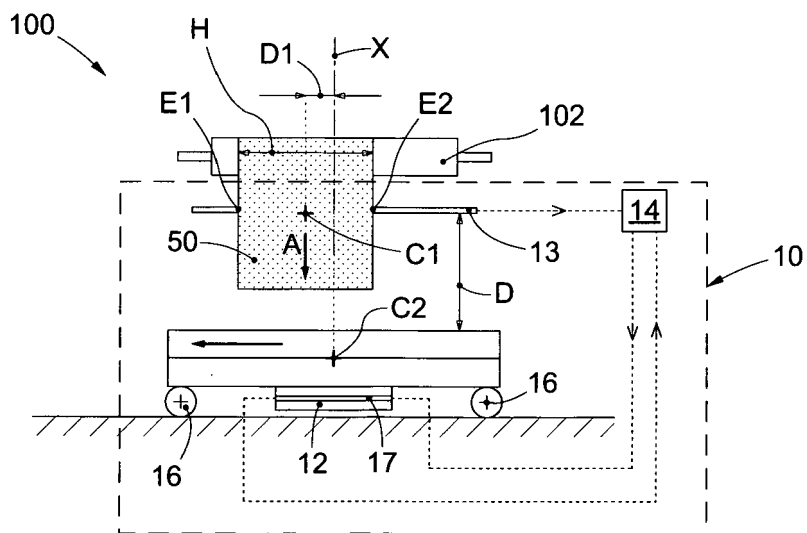
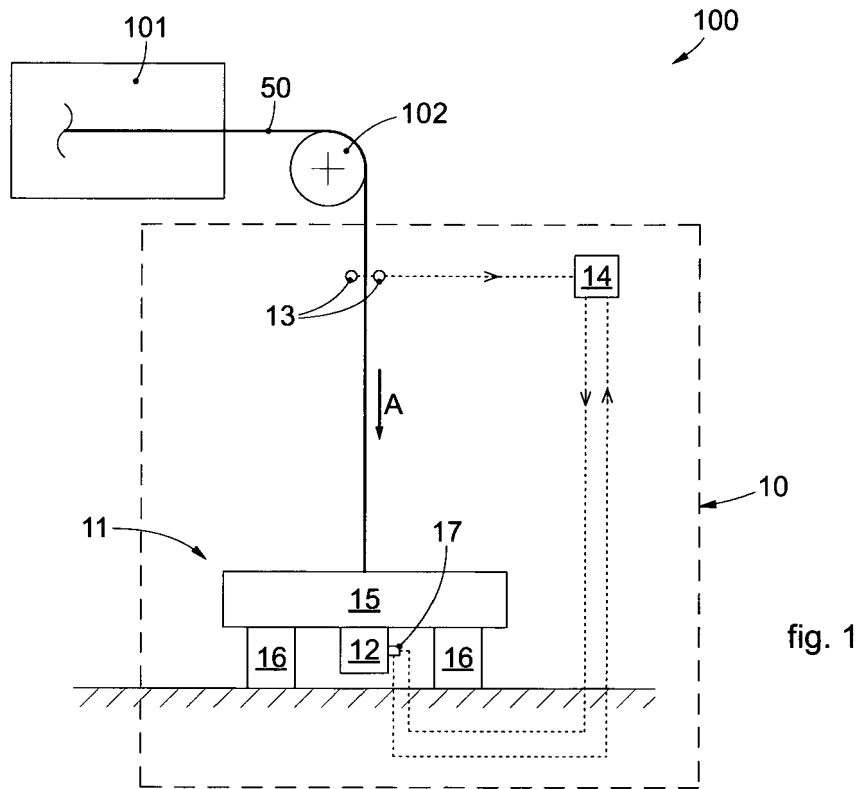
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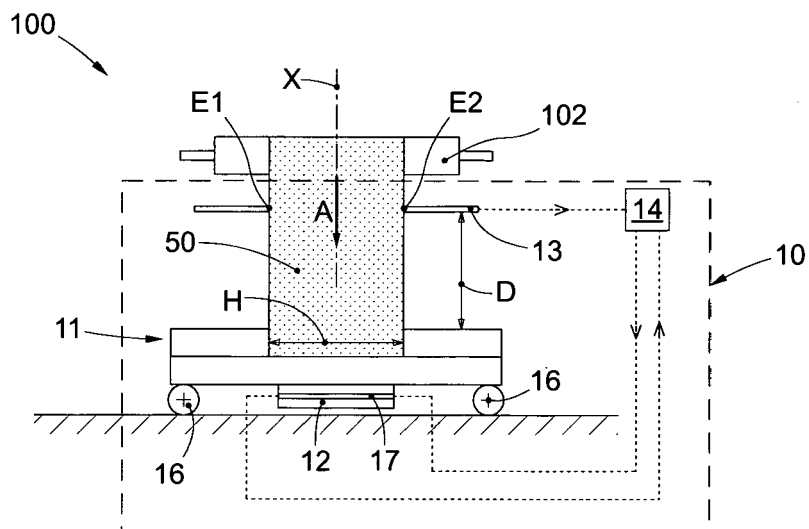


fig. 3

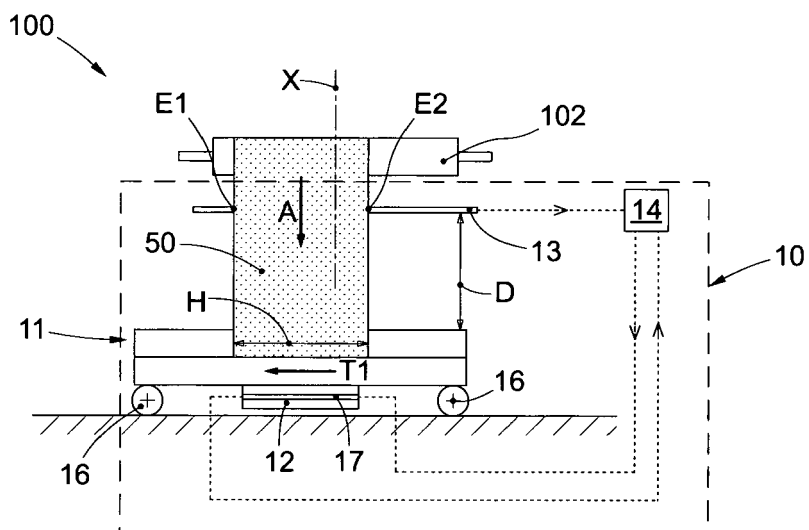


fig. 4

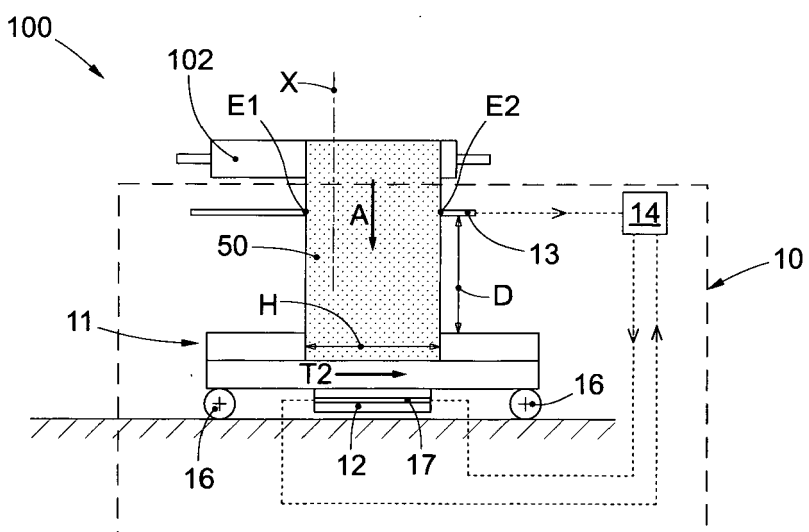


fig. 5

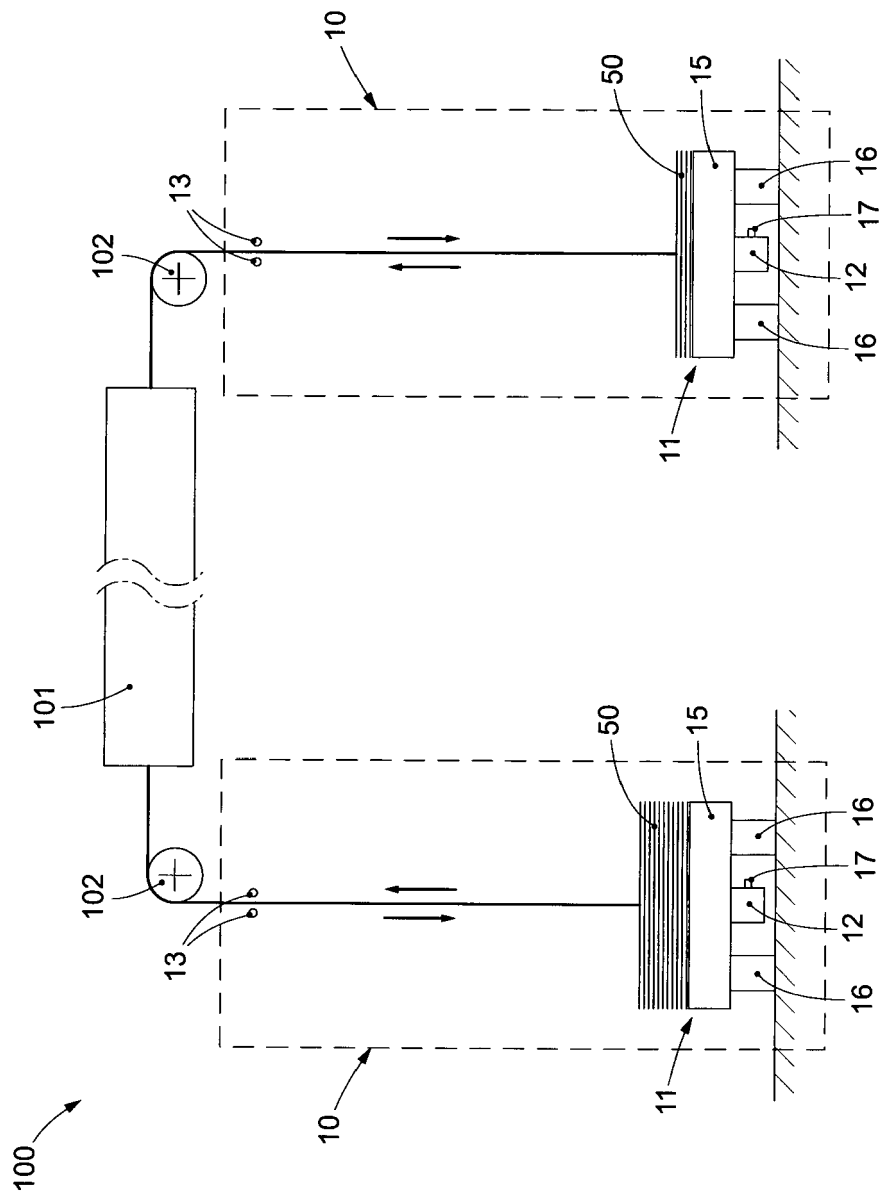


fig. 6



EUROPEAN SEARCH REPORT

Application Number
EP 20 42 5039

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DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	US 4 077 579 A (SELESKI RICHARD C ET AL) 7 March 1978 (1978-03-07) * claims 1,2,5; figure 1 *	1-5,9, 10,12	INV. B65H23/032 B65H23/02
X	EP 2 703 325 A2 (SEIKO EPSON CORP [JP]) 5 March 2014 (2014-03-05) * paragraphs [0008], [0030], [0067] - [0077]; figures 1-3 *	1-8,10, 12,14,15	
X	CN 104 276 420 A (YANGZHOU XIANGBEI MACHINERY CO LTD) 14 January 2015 (2015-01-14) * abstract; figure 1 *	1-5,12	
X	US 2015/239181 A1 (CORRADINI SYLVAIN [FR] ET AL) 27 August 2015 (2015-08-27) * paragraphs [0007] - [0020], [0040] - [0054]; figures 1,2 *	1-8, 10-12, 14,15	
X	DE 12 19 576 B (CONTINENTAL ELEKTRO IND AG) 23 June 1966 (1966-06-23) * claim 1; figure 1 *	1-5,12	TECHNICAL FIELDS SEARCHED (IPC) B65H
X	FR 2 294 964 A1 (ELMEG [DE]) 16 July 1976 (1976-07-16) * claims 1-3; figures 2,3 *	1-7,12, 14	
X	WO 92/18968 A1 (BROSE CARL GMBH [DE]) 29 October 1992 (1992-10-29) * claims 1,3,5; figure 1 *	1-5,8, 10-12,15	
X	CN 110 155 780 A (NANJING LINKCONTROL INTELLIGENT TECH CO LTD) 23 August 2019 (2019-08-23) * abstract; figures 1-7 *	1-8, 10-12, 14,15	
-/--			
The present search report has been drawn up for all claims			
Place of search The Hague		Date of completion of the search 11 March 2021	Examiner Pussemier, Bart
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	

EPO FORM 1503 03.82 (P04C01)



EUROPEAN SEARCH REPORT

Application Number
EP 20 42 5039

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DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	US 4 021 031 A (MEIHOFFER EDWARD F ET AL) 3 May 1977 (1977-05-03) * claims 1-6; figure 1 *	1-5,8, 10-12,15	
X	DE 197 25 223 A1 (ROVEMA GMBH [DE]) 17 December 1998 (1998-12-17) * figure 3 *	1-5,12	
X	US 4 860 964 A (ISHII YOSHIYUKI [JP] ET AL) 29 August 1989 (1989-08-29) * column 2, line 41 - column 4, line 41; figures 1-4 *	1-5, 8-10,12, 13,15	
The present search report has been drawn up for all claims			TECHNICAL FIELDS SEARCHED (IPC)
Place of search The Hague		Date of completion of the search 11 March 2021	Examiner Pussemier, Bart
CATEGORY OF CITED DOCUMENTS			
X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document		T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document	

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EPO FORM 1503 03.82 (P04C01)

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

EP 20 42 5039

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
The European Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

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15

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25

30

35

40

45

50

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 4077579	A	07-03-1978	NONE
EP 2703325	A2	05-03-2014	CN 103660629 A 26-03-2014
			CN 107264081 A 20-10-2017
			EP 2703325 A2 05-03-2014
			JP 6094414 B2 15-03-2017
			JP 2014061993 A 10-04-2014
			KR 20140029310 A 10-03-2014
			TW 201414619 A 16-04-2014
			US 2014063163 A1 06-03-2014
			US 2016221372 A1 04-08-2016
CN 104276420	A	14-01-2015	NONE
US 2015239181	A1	27-08-2015	BR 112015005799 A2 04-07-2017
			CA 2884346 A1 20-03-2014
			CN 104703780 A 10-06-2015
			EP 2895316 A1 22-07-2015
			FR 2995553 A1 21-03-2014
			FR 2995555 A1 21-03-2014
			JP 6235594 B2 22-11-2017
			JP 2015531322 A 02-11-2015
			RU 2015114269 A 10-11-2016
			US 2015239181 A1 27-08-2015
			WO 2014041295 A1 20-03-2014
DE 1219576	B	23-06-1966	NONE
FR 2294964	A1	16-07-1976	DE 2459747 A1 01-07-1976
			FR 2294964 A1 16-07-1976
WO 9218968	A1	29-10-1992	NONE
CN 110155780	A	23-08-2019	NONE
US 4021031	A	03-05-1977	DE 2654684 A1 16-06-1977
			FR 2334600 A1 08-07-1977
			GB 1527430 A 04-10-1978
			JP S5271059 A 14-06-1977
			US 4021031 A 03-05-1977
DE 19725223	A1	17-12-1998	NONE
US 4860964	A	29-08-1989	JP H0657580 B2 03-08-1994
			JP S63127965 A 31-05-1988
			US 4860964 A 29-08-1989

EPO FORM P0459

For more details about this annex : see Official Journal of the European Patent Office, No. 12/82

55

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

EP 20 42 5039

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
The European Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

11-03-2021

10	Patent document cited in search report	Publication date	Patent family member(s)	Publication date
15				
20				
25				
30				
35				
40				
45				
50				

EPO FORM P0459

For more details about this annex : see Official Journal of the European Patent Office, No. 12/82