(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) **EP 4 461 853 A1**

(12) **EUROPEAN PATENT APPLICATION**

(43) Date of publication:
13.11.2024 Bulletin 2024/46

(21) Application number: **24174888.8**

(22) Date of filing: **08.05.2024**

(51) International Patent Classification (IPC):
D01G 15/40 *(2006.01)* ***D01G 23/04*** *(2006.01)*
D02G 3/04 *(2006.01)* ***D01G 13/00*** *(2006.01)*
D01G 15/52 *(2006.01)* ***D01G 21/00*** *(2006.01)*

(52) Cooperative Patent Classification (CPC):
D01G 23/04; D01G 13/00; D01G 15/40; D01G 15/52; D01G 21/00; D02G 3/04; D02G 3/346

(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 ME MK MT NL NO PL PT RO RS SE SI SK SM TR
Designated Extension States:
BA
Designated Validation States:
GE KH MA MD TN

(30) Priority: **11.05.2023 IT 202300009438**

(71) Applicant: **Di.Vè S.p.A.**
13882 Cerrione (Biella) (IT)

(72) Inventor: **PARLAMENTO, Roberto**
13882 CERRIONE (BIELLA) (IT)

(74) Representative: **Di Biase, Fabio**
Jacobacci & Partners S.p.A.
Via Senato, 8
20121 Milano (IT)

(54) **SYSTEM AND METHOD FOR THE PRODUCTION OF A SHADED CARDED YARN**

(57) A method for obtaining a shaded carded yarn by means of a system (1) for obtaining a shaded carded yarn, comprising the steps of producing a plurality of intimate fiber blends (2) of different type, for example a plurality of intimate fiber blends (2) having different coloring or different fiber type, at least a first intimate fiber blend (2') and a second intimate fiber blend (2") of which being different; loading the plurality of intimate fiber blends (2) into respective containment bins (3) so that each bin (3) contains a single intimate fiber blend (2); unloading the first intimate fiber blend (2') from the respective bin (3) onto a belt (4); transferring the first intimate fiber blend (2') from the belt (4) to a carding station (5); determining the complete transfer of the first intimate fiber blend (2') from the belt (4) to the carding station (5) and the absence of substantial residuals of the first intimate fiber blend (2') on the belt (4); unloading the second intimate fiber blend (2") from the respective bin (3) onto the belt (4), the method further comprising a step of carding the one or more intimate fiber blends (2) to obtain a shaded carded web, a step of cutting the shaded carded web to obtain a plurality of rovings (19), a step of spinning the thread of the rovings (19) to obtain a shaded carded yarn (20), wherein a possible breakage of the rovings (19) or shaded carded yarns (20) is detectable by sensors, preferably optical sensors.

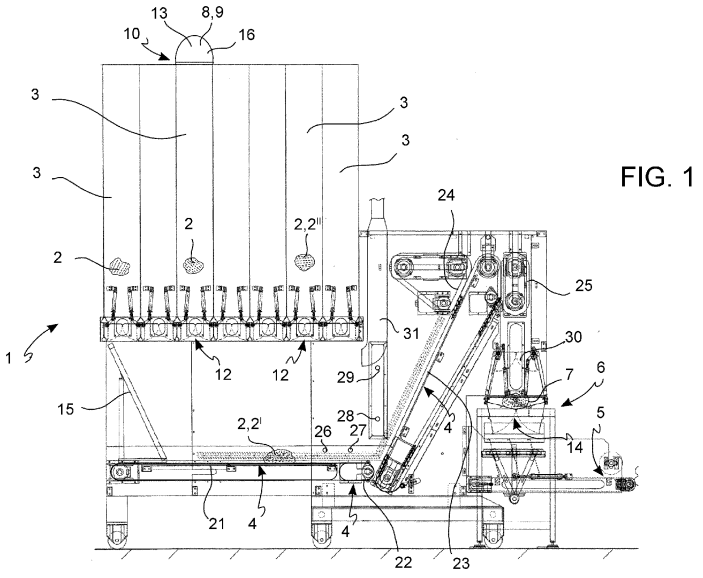


FIG. 1

EP 4 461 853 A1

Description

Field of the invention

[0001] The present invention relates to a system for obtaining a shaded carded yarn and a method for obtaining a shaded carded yarn, in which the yarn consists of natural, synthetic, artificial, aramid, fibers, etc., of different types and coloring, the composition of which is controlled and adjusted with high precision.

Background art

[0002] Using the carding process, it is possible to process fibers of any nature and fineness, which are transformed into a roving or sliver, as needed, containing fibers directed in the winding direction of the roving itself only for about 60% of the total fibrous mass, unlike the combed spinning process where the fibers are instead directed in the winding direction of the roving for the whole fibrous mass.

[0003] It is known to perform the carding by including an initial blending step aimed at mixing, partially parallelizing and aggregating the input fibers, tending to make the final product as uniform as possible, and thus eliminating the intrinsic differences naturally present in the fibers.

[0004] Such a blending step of the prior art provides loading the mass fibers into a blending cell provided with fans which generate vortexes that move, aggregate and mix the different fibers.

[0005] Following such a known blending step, "blends" are produced, i.e., aggregates of mixed fibers, which are substantially uniform, which are later intended for the carding, and therefore will feed a carding machine, or "carder".

[0006] The known carding process, and the initial blending step in particular, do not allow obtaining shaded carded yarns, and in particular which shade is predetermined, controlled and adjusted, because the blends obtained from the prior art, which are further used to obtain the yarn, are substantially the same.

[0007] The need is therefore felt to provide a system for obtaining a shaded carded yarn and a method for obtaining a shaded carded yarn which obviate the criticalities highlighted in the prior art.

Solution

[0008] It is the object of the present invention to provide a system and a method for obtaining a shaded carded yarn such as to overcome the problems highlighted in the prior art.

[0009] It is a particular object of the present invention to provide a system and a method for obtaining a shaded carded yarn, which allow obtaining a shaded carded yarn, the composition and shade of which are predetermined, controlled, and adjusted with high precision.

[0010] These and other objects are achieved by a system for obtaining a shaded carded yarn and a method for obtaining a shaded carded yarn according to the independent claims.

[0011] The dependent claims relate to preferred and advantageous embodiments of the present invention.

Drawings

[0012] In order to better understand the invention and appreciate the advantages thereof, some non-limiting exemplary embodiments thereof will be described below with reference to the accompanying drawings, in which:

- Figure 1 is a side view, showing visible and non-visible details, of a system for obtaining a shaded carded yarn, according to an embodiment of the invention;
- Figure 2 is a side view of a system for obtaining a shaded carded yarn, according to an embodiment of the invention;
- Figure 3 is a perspective view of a system for obtaining a shaded carded yarn, according to an embodiment of the invention;
- Figure 4 is a perspective view of a working station of a system for obtaining a shaded carded yarn, according to an embodiment of the invention;
- Figure 5 is a perspective view of a further working station of a system for obtaining a shaded carded yarn, according to an embodiment of the invention;
- Figure 6 is a perspective view of a further working station of a system for obtaining a shaded carded yarn, according to an embodiment of the invention.

Description of some preferred embodiments

[0013] With reference to the drawings, a system for obtaining a shaded carded yarn is generally indicated by reference numeral 1.

[0014] System 1 is usable to perform a method for obtaining a shaded carded yarn.

Method for obtaining a shaded carded yarn

[0015] The method for obtaining a shaded carded yarn comprises the following steps:

- producing, or disposing, a plurality of intimate fiber blends 2 of different type, for example, a plurality of intimate fiber blends 2 having different coloring or different fiber type, at least a first intimate fiber blend 2' and a second intimate fiber blend 2" of which being different;
- loading the plurality of intimate fiber blends 2 into respective containment bins 3 so that each bin 3 contains a single intimate fiber blend 2;
- unloading the first intimate fiber blend 2' from the respective bin 3 onto a belt 4. If several bins 3 simul-

taneously contain respective intimate fiber blends 2, keeping the remaining intimate fiber blends 2 in the respective bins 3 when unloading the first intimate fiber blend 2' onto belt 4.

- transferring the first intimate fiber blend 2' from belt 4 to a carding station 5;
- determining the complete transfer of the first intimate fiber blend 2' from belt 4 to the carding station 5 and the absence of substantial residuals of the first intimate fiber blend 2' on belt 4;
- unloading the second intimate fiber blend 2" from the respective bin 3 onto belt 4.

[0016] Advantageously, a method thus configured allows conveying the different types of intimate fiber blends 2 to a carding station 5 in a selective and controlled manner in order to then obtain a shaded carded yarn with predetermined composition and shade, controlled and adjusted with high precision.

[0017] Specifically, such a method prevents an undesired mixing between intimate fiber blends 2 having different coloring or type before they are transferred to the carding station 5. Indeed, such an undesired mixing would affect the resulting yarn and not allow controlling or determining the shade of the final carded yarn in advance.

[0018] Therefore, a method thus configured ensures control over the end results, allowing a carded yarn with the desired shade to be obtained with high precision.

[0019] "Intimate fiber blend" means a set of mixed and/or tangled fibers. Specifically, the intimate fiber blends of the present invention are obtained by means of composition with very precise and well-defined percentages of fibers so as to obtain the desired intimate fiber blends having an intimate mixture of different fibers and/or colors.

[0020] According to an embodiment, belt 4 comprises, in sequence, a conveyor belt 21, an extractor belt 22, a hooked loading belt 23, and a hooked unloading belt 25.

[0021] The step of unloading the first intimate fiber blend 2' from the respective bin 3 onto a belt 4 comprises the step of unloading the first intimate fiber blend 2' from the respective bin 3 onto the conveyor belt 21.

[0022] Further, the step of transferring the first intimate fiber blend 2' from belt 4 to a carding station 5 comprises the steps of:

- transporting, by the conveyor belt 21, the first intimate fiber blend 2' to the extractor belt 22,
- extracting, by the extractor belt 22, the first intimate fiber blend 2' from the conveyor belt 21 and transferring the first intimate fiber blend 2' onto the hooked loading belt 23,
- transporting, by the hooked loading belt 23, the first intimate fiber blend 2' to the hooked unloading belt 25,
- extracting, by the hooked unloading belt 25, the first intimate fiber blend 2' from the hooked loading belt 23 and unloading the first intimate fiber blend 2' to the carding station 5.

[0023] According to an embodiment, belt 4 further comprises a hooked meter belt 24.

[0024] The hooked meter belt 24 is positioned at the hooked loading belt 23, at an end of the hooked loading belt 23 opposite to the extractor belt 22.

[0025] Further, the step of transferring the first intimate fiber blend 2' from belt 4 to a carding station 5 comprises the step of leveling, by the hooked meter belt 24, the thickness of the first intimate fiber blend 2' transported by the hooked loading belt 23 to the hooked unloading belt 25.

[0026] The leveling of the thickness of the first intimate fiber blend 2' is performed by rotating the hooked meter belt 24 in the same direction as the rotation direction of the hooked loading belt 23.

[0027] Thickness means the thickness of the intimate fiber blend 2 measured in direction transverse to the hooked loading belt 23 along which the intimate fiber blend 2 is transported.

[0028] Advantageously, such a configuration avoids transferring, to the carding station 5, "blocks" of intimate fiber blend 2 which are too thick and would affect the end result.

[0029] According to an embodiment, the step of extracting the first intimate fiber blend 2' from the hooked loading belt 23 and unloading the first intimate fiber blend 2' to the carding station 5 is performed by a rotation of the hooked unloading belt 25 in the direction opposite to the rotation direction of the hooked loading belt 23.

[0030] Thereby, the hooks of the hooked unloading belt 25 intersect with the hooks of the hooked loading belt 23 to hook the first intimate fiber blend 2' from the hooked loading belt 23 and unload the first intimate fiber blend 2' to the carding station 5.

[0031] Preferably, the first intimate fiber blend 2' is unloaded to a metering device 6.

[0032] According to an embodiment, the extractor belt 22 rotates in the same direction as the conveyor belt 21.

[0033] Further, the rotation speed of the extractor belt 22 is from two to ten times greater than the rotation speed of the conveyor belt 21.

[0034] Preferably, the rotation speed of the extractor belt 22 is from two to ten times greater than the rotation speed of the conveyor belt 21.

[0035] Advantageously, such a configuration ensures a controllable and monitorable transfer of the intimate fiber blend 2 to the carding station 5.

[0036] According to an embodiment, system 1 comprises, in sequence, a first photocell 26, a second photocell 27, a third photocell 28, and a fourth photocell 29.

[0037] The first photocell 26 is positioned at an end of the conveyor belt 21 facing the extractor belt 22.

[0038] The second photocell 27 is positioned at the extractor belt 22.

[0039] The third photocell 28 is positioned at an end

of the hooked loading belt 23 facing the extractor belt 22.

[0040] The fourth photocell 29 is positioned at the hooked loading belt 23, above the third photocell 28.

[0041] Further, the first, second, third and fourth photocells 26, 27, 28, 29 are configured to detect the presence or absence of an intimate fiber blend 2 or residuals of intimate fiber blend 2 on the respective belt 21, 22, 23, 24, 25 at which they are positioned.

[0042] The step of transferring the first intimate fiber blend 2' from belt 4 to a carding station 5 comprises the following steps:

- when the fourth photocell 29 detects the presence of an intimate fiber blend 2 or residuals of intimate fiber blend 2 on the hooked loading belt 23, the hooked loading belt 23 continues rotating and transferring the intimate fiber blend 2 to the carding station 5, while the conveyor belt 21 is stopped;
- when the fourth photocell 29 does not detect the presence of an intimate fiber blend 2 or residuals of intimate fiber blend 2 on the hooked loading belt 23, the conveyor belt 21 and the extractor belt 22 are actuated so as to load a further intimate fiber blend 2 or further residuals of intimate fiber blend 2 onto the hooked loading belt 23 until the fourth photocell 29 again detects the presence of an intimate fiber blend 2 or residuals of intimate fiber blend 2 on the hooked loading belt 23;
- when the first photocell 26 no longer detects the presence of an intimate fiber blend 2 or residuals of intimate fiber blend 2 on the conveyor belt 21, the extractor belt 22 and the hooked loading belt 23 continue rotating, and optionally the conveyor belt 21 is stopped;
- when the second photocell 27 no longer detects the presence of an intimate fiber blend 2 or residuals of intimate fiber blend 2 on the extractor belt 22, the hooked loading belt 23 continues rotating so as to complete the transfer of the intimate fiber blend 2 to the carding station 5;
- when also the third photocell 28 no longer detects the presence of an intimate fiber blend 2 or residuals of intimate fiber blend 2 on the hooked loading belt 23, the substantial complete transfer of the intimate fiber blend 2 to the carding station 5 is determined.

[0043] Advantageously, such a configuration ensures the complete and controlled transfer of the intimate fiber blend 2 to the carding station 5, thus avoiding undesired mixing with different intimate fiber blends 2.

[0044] According to an embodiment, system 1 comprises a movable thrust wall 15.

[0045] The movable thrust wall 15 is positioned at the conveyor belt 21 and is configured to translate in a direction parallel to the conveyor belt 21 towards the extractor belt 22, from a stroke start position to a stroke end position, and vice versa.

[0046] The stroke end position is positioned substantially at the first photocell 26.

[0047] The step of transferring the first intimate fiber blend 2' from belt 4 to a carding station 5 comprises the following steps:

- when the fourth photocell 29 detects the presence of an intimate fiber blend 2 or residuals of intimate fiber blend 2 on the hooked loading belt 23, the hooked loading belt 23 continues rotating while the conveyor belt 21 and the movable thrust wall 15 are stopped;
- when the fourth photocell 29 does not detect the presence of an intimate fiber blend 2 or residuals of intimate fiber blend 2 on the hooked loading belt 23, the thrust wall 15 is translated in the direction of the stroke end position and the conveyor belt 21 and the extractor belt 22 are actuated so as to load a further intimate fiber blend 2 or further residuals of intimate fiber blend 2 onto the hooked loading belt 23 until the fourth photocell 29 again detects the presence of an intimate fiber blend 2 or residuals of intimate fiber blend 2 on the hooked loading belt 23;
- when the first photocell 26 no longer detects the presence of an intimate fiber blend 2 or residuals of intimate fiber blend 2 on the conveyor belt 21, the movable thrust wall 15 has reached the stroke end position, and the extractor belt 22 and the hooked loading belt 23 continue rotating;
- when the second photocell 27 no longer detects the presence of an intimate fiber blend 2 or residuals of intimate fiber blend 2 on the extractor belt 22, the hooked loading belt 23 continues rotating so as to complete the transfer of the intimate fiber blend 2 to the carding station 5;
- when also the third photocell 28 no longer detects the presence of an intimate fiber blend 2 or residuals of intimate fiber blend 2 on the hooked loading belt 23, the substantial complete transfer of the intimate fiber blend 2 to the carding station 5 is determined and the movable thrust wall 15 returns to the stroke start position, and the second intimate fiber blend 2" is unloaded from the respective bin 3 onto the conveyor belt 21.

[0048] Advantageously, such a configuration ensures the complete and controlled transfer of the intimate fiber blend 2 to the carding station 5, thus avoiding undesired mixing with different intimate fiber blends 2.

[0049] According to an embodiment, the rotation speed of the hooked loading belt 23 is adjusted as a function of the amount of intimate fiber blend 2 on belt 4.

[0050] A decrease in the amount of intimate fiber blend 2 on belt 4 corresponds to an increase in the rotation speed of the hooked loading belt 23.

[0051] Vice versa, an increase in the amount of intimate fiber blend 2 on belt 4 corresponds to a decrease in the rotation speed of the hooked loading belt 23.

[0052] According to an embodiment, the rotation

speed of the hooked loading belt 23 is inversely proportional to the rotation speed of the hooked meter belt 24.

[0053] A decrease in the amount of intimate fiber blend 2 on belt 4 corresponds to an increase in the rotation speed of the hooked loading belt 23 and a related decrease in the rotation speed of the hooked meter belt 24.

[0054] Vice versa, an increase in the amount of intimate fiber blend 2 on belt 4 corresponds to a decrease in the rotation speed of the hooked loading belt 23 and a related increase in the rotation speed of the hooked meter belt 24.

[0055] Advantageously, such a configuration ensures transferring the intimate fiber blend 2 to the carding station 5 within the times established by the carding station 5 for receiving the intimate fiber blend 2, and simultaneously avoids transferring too thick an intimate fiber blend 2 to the carding station 5, thus avoiding the end result from being affected.

[0056] According to an embodiment, system 1 comprises a metering device 6.

[0057] Preferably, the metering device 6 is an electronic scale.

[0058] The metering device 6 is configured to receive portions of intimate fiber blend 2 from the hooked unloading belt 25, dose and transfer the portions of intimate fiber blend 2 to the carding station 5.

[0059] The step of transferring the first intimate fiber blend 2' from belt 4 to a carding station 5 comprises the steps of:

- gradually depositing a plurality of portions of the first intimate fiber blend 2' on the metering device 6 over an actual time interval so as to obtain a predefined intimate fiber blend dose 7 having a predefined weight;
- transferring the predefined intimate fiber blend dose 7 from the metering device 6 to the carding station 5 at the end of a cycle time interval;

  where the actual time interval is less than the cycle time interval,
  and optionally:

  - determining a threshold time interval, where the threshold time interval is less than the cycle time interval and greater than the actual time interval, and preferably the threshold time interval is between 50% and 99% of the cycle time,
  - determining a minimum threshold time interval and a maximum threshold time interval, both less than the threshold time interval, and where the minimum threshold time interval is less than the maximum threshold time interval,
  - monitoring that the actual time interval is less than the threshold time interval,
  - when the actual time interval is equal to or greater than the maximum threshold time interval, the rotation speed of the hooked loading belt 23 is increased;
  - vice versa, when the actual time interval is equal to or less than the minimum threshold time interval, the rotation speed of the hooked loading belt 23 is decreased.

[0060] Advantageously, such a configuration allows synchronizing the controlled transfer of intimate fiber blend 2 with the cycle time determinable by the carding station 5, thus avoiding undesired mixing of the intimate fiber blends 2 and avoiding too much material or too thick an intimate fiber blend 2 to be transferred to the carding station 5, which would affect the end result. Too thick an intimate fiber blend 2 could be generated if the intimate fiber blend 2 were transferred too quickly to the carding station 5, i.e., with a shorter actual time than the cycle time.

[0061] According to an embodiment, system 1 comprises at least one barrier gate 30 interposed between the hooked unloading belt 25 and the metering device 6.

[0062] The step of transferring the first intimate fiber blend 2' from belt 4 to a carding station 5 comprises the steps of:

- keeping the barrier gate 30 open during the actual time interval so as to allow the formation of the predefined intimate fiber blend dose 7 on the metering device 6;
- closing the barrier gate 30 upon the completion of the formation of the predefined intimate fiber blend dose 7, at the end of the actual time interval, so as to prevent further residuals of intimate fiber blend 2 from depositing on the metering device 6,
- preferably transferring the predefined intimate fiber blend dose 7 contained in the metering device 6 to the carding station 5 by opening an openable bottom 14 of the metering device 6.

[0063] According to an embodiment, the step of loading the plurality of intimate fiber blends 2 into respective containment bins 3 so that each bin 3 contains a single intimate fiber blend 2 comprises providing a pneumatic supply system 8, comprising a supply duct 9 connected to a carriage 10 and a pneumatic pumping system comprising a fan 13 and a cyclone 16.

[0064] Cyclone 16 is interposed between bin 3 and fan 13 and is configured to slow down the intimate fiber blend 2 conveyed by fan 13 and expel excess air conveyed by fan 13.

[0065] Further, the pneumatic pumping system is configured to convey a pneumatic flow into the supply duct 9.

[0066] The method further comprises:

- translating the supply duct 9, by carriage 10, to a given bin 3 intended to receive the related intimate fiber blend 2;

- inserting the related intimate fiber blend 2 into the supply duct 9 so as to convey the intimate fiber blend 2 into cyclone 16 and then loading the related intimate fiber blend 2 into the respective bin 3 by means of a pneumatic flow conveyed by fan 13 of the pneumatic pumping system.

[0067] According to an embodiment, the method comprises:

- determining, by a sensor system, preferably optical sensors, the complete emptying of a given bin 3 to be loaded with a new intimate fiber blend 2;
- loading the new intimate fiber blend 2 into the empty bin 3.

[0068] According to an embodiment, the method comprises determining, by the electronic processing unit 11, the given intimate fiber blend 2 to be loaded into the respective bin 3 based on a programmable loading sequence determined by the electronic processing unit 11.

[0069] According to an embodiment, the step of unloading the intimate fiber blend 2 from the respective bin 3 onto belt 4 comprises determining, by an electronic processing unit 11 of system 1, the given intimate fiber blend 2 to be unloaded based on a programmable unloading sequence determined by the electronic processing unit 11.

[0070] According to an embodiment, the step of unloading the intimate fiber blend 2 from the respective bin 3 onto belt 4 comprises:

- providing bins 3 comprising an openable bottom gate 12 and a pneumatic pumping system, respectively;
- opening the bottom gate 12 of the respective bin 3 containing the respective intimate fiber blend 2 to be unloaded and pumping a pressurized air flow into the given bin 3, in a direction exiting the bottom gate 12 so as to unload the intimate fiber blend 2 exiting from bin 3;
  and optionally,
- detecting the complete emptying of bin 3 by means of a sensor system, preferably optical sensors,
  and optionally,
- providing a suction hopper 31 and sucking air from system 1 so as to decrease the turbulence generated by the unloading of the intimate fiber blend 2 from bin 3 to belt 4.

[0071] According to an embodiment, following the step of transferring the first intimate fiber blend 2' from belt 4 to a carding station 5, the method comprises the step of:

- carding, in a carding station 5, the one or more intimate fiber blends 2 transferred to the carding station 5 so as to obtain a shaded carded web;
- in a cutting station 17, cutting the shaded carded web so as to obtain a plurality of rovings 19 of shaded carded thread;
- in a spinning frame 18, spinning the thread of the shaded carded rovings 19, preferably by drawing or twisting the thread, so as to obtain a shaded carded yarn 20; detecting, preferably by vibration sensors, the possible breakage of yarn 20 and temporarily stopping the spinning upon the possible breakage of the shaded yarn 20;
- optionally, in a winding station, winding the shaded carded yarn 20 so as to obtain a plurality of perfectly identical spools of shaded carded yarn.

[0072] According to an embodiment, the step of spinning the thread of the shaded carded rovings 19 comprises the step of:

- detecting, by preferably optical sensors, the possible breakage of roving 19 or shaded carded yarn 20 and stopping the spinning of roving 19 at the possible breakage of the roving or shaded carded yarn 20;
  and/or
- monitoring and adjusting, by the electronic processing unit 11, the carding of the one or more different intimate fiber blends 2 so as to even the thickness of the shaded carded web produced by the carding station 5;
  and/or
- after the carding, cleaning the carding station 5 of any residuals of intimate fiber blends 2, preferably by means of compressed air cleaners or blowers.

[0073] Naturally, the preceding production steps described with reference to the first intimate fiber blend 2' are also applicable to the second intimate fiber blend 2" processed after the first intimate fiber blend 2', and to possible further intimate fiber blends 2 processed after the first and second intimate fiber blends 2', 2".

System 1

[0074] According to a further aspect of the invention, a system 1 for obtaining a shaded carded yarn comprises a plurality of containment bins 3 configured to contain a respective intimate fiber blend 2.

[0075] System 1 comprises a belt 4 configured to receive the intimate fiber blends 2 unloaded from the respective bins 3.

[0076] System 1 comprises a carding station 5 positioned downstream of belt 4 and configured to receive the intimate fiber blends 2 from belt 4.

[0077] System 1 comprises means for determining the complete transfer of the first intimate fiber blend 2' from belt 4 to the carding station 5 and the absence of substantial residuals of the first intimate fiber blend 2' on belt 4.

[0078] Advantageously, a system 1 thus configured allows sending the different types of intimate fiber blends 2 to a carding station 5 in a selective and controlled man-

ner in order to then obtain a shaded carded yarn with predetermined composition and shade, controlled and adjusted with high precision.

[0079] Specifically, such a system 1 is configured to prevent an undesired mixing between intimate fiber blends 2 having different coloring or type before they are transferred to the carding station 5. Indeed, such an undesired mixing would affect the resulting yarn and not allow controlling or determining the shade of the final carded yarn in advance.

[0080] Therefore, a system 1 thus configured ensures the control over the end result, allowing a carded yarn with the desired shade to be obtained with high precision.

[0081] According to an embodiment, belt 4 comprises, in sequence, a conveyor belt 21, an extractor belt 22, a hooked loading belt 23, and a hooked unloading belt 25.

[0082] Further, system 1 is configured to unload the first intimate fiber blend 2' from the respective bin 3 onto the conveyor belt 21.

[0083] The extractor belt 21 is configured to transport the first intimate fiber blend 2' to the extractor belt 22.

[0084] The extractor belt 22 is configured to extract the first intimate fiber blend 2' from the conveyor belt 21 and transfer the first intimate fiber blend 2' onto the hooked loading belt 23.

[0085] The hooked loading belt 23 is configured to the first intimate fiber blend 2' to the hooked unloading belt 25.

[0086] The hooked unloading belt 25 is configured to extract the first intimate fiber blend 2' from the hooked loading belt 23 and unload the first intimate fiber blend 2' to the carding station 5.

[0087] According to an embodiment, belt 4 further comprises a hooked meter belt 24 positioned at the hooked loading belt 23, at an end of the hooked loading belt 23 opposite to the extractor belt 22.

[0088] The hooked meter belt 24 is configured to level the thickness of the first intimate fiber blend 2' transported by the hooked loading belt 23 to the hooked unloading belt 25.

[0089] According to an embodiment, the hooked unloading belt 25 is configured to rotate in a direction opposite to the rotation direction of the hooked loading belt 23. Therefore, if the hooked unloading belt 25 rotates in a counter-clockwise direction, the hooked loading belt 23 rotates in a clockwise direction, and vice versa. Therefore, according to such a configuration, the hooks of the mutually facing hooked loading 23 and unloading 25 belt are directed in a same tangential direction.

[0090] Preferably, the hooked unloading belt 25 is configured to rotate at a greater speed than the hooked loading belt 23. Advantageously, this facilitates the extraction of intimate fiber blend 2 from the hooked loading belt 23 and the unloading to the carding station 5.

[0091] According to an embodiment, the hooked loading belt 23 and the hooked unloading belt 25 are positioned with respect to each other and configured so that the hooks of the hooked unloading belt 25 intersect with the hooks of the hooked loading belt 23. Advantageously, this facilitates the action of hooking the first intimate fiber blend 2' by the hooked loading belt 23 and unloading the first intimate fiber blend 2' to the carding station 5, preferably to a metering device 6.

[0092] According to an embodiment, the extractor belt 22 is configured to rotate in the same direction as the conveyor belt 21. Therefore, if the conveyor belt 21 rotates in counter-clockwise direction, also the extractor belt 22 rotates in counter-clockwise direction, and vice versa. Therefore, according to such a configuration, the surfaces of the mutually facing conveyor belt 21 and the extractor belt 22 are directed in two opposite tangential directions.

[0093] According to an embodiment, the extractor belt 22 is configured to rotate at a speed from two to five times greater than the rotation speed of the conveyor belt 21. Preferably, the extractor belt 22 is configured to rotate at a speed from two to three times greater than the rotation speed of the conveyor belt 21.

[0094] According to an embodiment, system 1 comprises, in sequence, a first photocell 26, a second photocell 27, a third photocell 28, and a fourth photocell 29, where:

- the first photocell 26 is positioned at an end of the conveyor belt 21 facing the extractor belt 22,
- the second photocell 27 is positioned at the extractor belt 22,
- the third photocell 28 is positioned at an end of the hooked loading belt 23 facing the extractor belt 22,
- the fourth photocell 29 is positioned at the hooked loading belt 23, above the third photocell 28, and optionally the fourth photocell 29 is movable in height with respect to the third photocell 28.

[0095] The first, second, third and fourth photocells 26, 27, 28, 29 are configured to detect the presence or absence of an intimate fiber blend 2 or residuals of intimate fiber blend 2 on the respective belt 21, 22, 23, 25 at which they are positioned.

[0096] The conveyor belt 21, the extractor belt 22, the hooked loading belt 23, and the hooked unloading belt 25 are configured to be selectively movable depending on the detection of the presence or absence of an intimate fiber blend 2 or residuals of intimate fiber blend 2 by the first and/or second and/or third and/or fourth photocells 26, 27, 28, 29.

[0097] According to an embodiment, system 1 comprises a movable thrust wall 15 positioned at the conveyor belt 21 and configured to translate in a direction parallel to the conveyor belt 21 towards the extractor belt 22, from a stroke start position to a stroke end position, and vice versa.

[0098] The stroke end position is positioned substantially at the first photocell 26.

[0099] The movable thrust wall 15 is configured to be selectively movable depending on the detection of the

presence or absence of an intimate fiber blend 2 or residuals of intimate fiber blend 2 by the first and/or second and/or third and/or fourth photocells 26, 27, 28, 29.

[0100] According to an embodiment, system 1 comprises a carding station 5, positioned downstream of belt 4 with reference to the forward direction of belt 4, configured to card the one or more intimate fiber blends 2 transferred to the carding station 5 so as to obtain a shaded carded web.

[0101] Further, system 1 comprises a cutting station 17 configured to cut the shaded carded web so as to obtain a plurality of rovings 19 of shaded carded thread.

[0102] Further, system 1 comprises a spinning frame 18 configured to spin the thread of the shaded carded rovings 19, preferably by drawing or twisting the thread, so as to obtain a shaded carded yarn 20.

[0103] According to an embodiment, system 1 comprises a winding station configured to wind the shaded carded yarn 20 so as to obtain a plurality of spools of shaded carded yarn.

[0104] According to an embodiment, system 1 comprises sensors, preferably optical sensors, configured to detect the possible breakage of the roving or shaded carded yarn 20, and locking means configured to stop the spinning of the rovings 19 at the possible breakage of the roving or shaded carded yarn 20 detected by the sensors.

[0105] According to an embodiment, system 1 comprises compressed air cleaners or blowers configured to clean the carding station 5 of any residuals of intimate fiber blends 2 after carding.

[0106] Advantageously, this avoids a possible and undesired mixing of residuals of intimate fiber blend 2 with different intimate fiber blends 2 then processed by the carding station 5, which would negatively affect the end result.

[0107] According to an embodiment, system 1 comprises an electronic processing unit 11.

[0108] The electronic processing unit 11 is configured to control system 1.

[0109] According to an embodiment, the electronic processing unit 11 is configured to monitor and adjust the carding of the one or more different intimate fiber blends 2 so as to even the thickness of the shaded carded web produced by the carding station 5.

[0110] According to an embodiment, the electronic processing unit 11 is configured to determine the given intimate fiber blend 2 to be unloaded based on an unloading sequence.

[0111] According to an embodiment, the electronic processing unit 11 is configured to load the given intimate fiber blends into the respective bins 3 based on a programmable loading sequence.

[0112] According to an embodiment, the method comprises monitoring and adjusting, by means of the electronic processing unit 11, the carding of the one or more different intimate fiber blends 2 so as to even the thickness of the shaded carded web produced by the carding station 5.

[0113] Advantageously, the method and the system 1 thus configured allow obtaining a shaded carded yarn, the composition and shade of which are predetermined, controlled, and adjusted with high precision.

[0114] Further advantageously, the method and the system 1 thus configured allow precisely adjusting and automating the production process of a shaded carded yarn.

[0115] Further advantageously, the method and the system 1 thus configured allow avoiding mixing types of intimate fiber blends 2, thus ensuring the precision of the end result.

[0116] In particular, the method and the system 1 thus configured allow effectively avoiding the presence of residuals of intimate fiber blend 2 which would otherwise get mixed with a subsequent intimate fiber blend 2 unloaded onto belt 4, which would affect the end result.

[0117] Further advantageously, the method and the system 1 thus configured allow supplying the carding station 5 with uniform intimate fiber blend doses, thus ensuring the production, by the carding station 5, of a uniform shaded carded web having a predetermined thickness, thus avoiding deformities in the creation of the shaded carded web.

[0118] Further advantageously, the method and the system 1 thus configured allow automating the in-line adjustment of the thickness of the shaded carded web produced by the carding station 5.

[0119] Further advantageously, the method and the system 1 thus configured allow ensuring the complete emptying of bin 3, avoiding possible undesired blending of residuals of the intimate fiber blend 2 with different intimate fiber blends 2 then loaded into bin 3, which would negatively affect the end result.

[0120] Further advantageously, the method and the system 1 thus configured allow loading the plurality of intimate fiber blends 2 into the respective bins 3 in an easy, quick manner and without damage.

[0121] Obviously, those skilled in the art will be able to make changes or adaptations to the present invention, without however departing from the scope of the following claims.

REFERENCE NUMERALS

[0122]

1. System
2. Intimate fiber blends
2'. First intimate fiber blend
2". Second intimate fiber blend
3. Containment bin
4. Belt
5. Carding station
6. Metering device
7. Predefined intimate fiber blend dose
8. Pneumatic supply system

9. Supply duct
10. Carriage
11. Electronic processing unit
12. Bottom gate
13. Fan
14. Openable bottom
15. Movable thrust wall
16. Cyclone
17. Cutting station
18. Spinning frame
19. Rovings
20. Shaded carded yarn
21. Conveyor belt
22. Extractor belt
23. Hooked loading belt
24. Hooked meter belt
25. Hooked unloading belt
26. First photocell
27. Second photocell
28. Third photocell
29. Fourth photocell
30. Barrier gate
31. Suction hopper

Claims

1. A method for obtaining a shaded carded yarn by means of a system (1) for obtaining a shaded carded yarn, comprising the following steps:

- producing, or disposing, a plurality of intimate fiber blends (2) of different type, for example a plurality of intimate fiber blends (2) having different coloring or different fiber type, at least a first intimate fiber blend (2') and a second intimate fiber blend (2") of which being different;
- loading the plurality of intimate fiber blends (2) into respective containment bins (3) so that each bin (3) contains a single intimate fiber blend (2);
- unloading the first intimate fiber blend (2') from the respective bin (3) onto a belt (4);
- transferring the first intimate fiber blend (2') from the belt (4) to a carding station (5);
- determining the complete transfer of the first intimate fiber blend (2') from the belt (4) to the carding station (5) and the absence of residuals of the first intimate fiber blend (2') on the belt (4);
- unloading the second intimate fiber blend (2") from the respective bin (3) onto the belt (4),

wherein following the step of transferring the first intimate fiber blend (2') from the belt (4) to a carding station (5), the method comprises the step of:

- carding, in a carding station (5), the one or more intimate fiber blends (2) transferred to the carding station (5) so as to obtain a shaded carded web;
- in a cutting station (17), cutting the shaded carded web so as to obtain a plurality of rovings (19) of shaded carded thread;
- in a spinning frame (18), spinning the thread of the shaded carded rovings (19), preferably by drawing or twisting the thread, so as to obtain a shaded carded yarn (20);
- optionally, in a winding station, winding the shaded carded yarn (20) so as to obtain a plurality of spools of shaded carded yarn.

2. A method according to claim 1, wherein the belt (4) comprises, in sequence, a conveyor belt (21), an extractor belt (22), a hooked loading belt (23), and a hooked unloading belt (25),

wherein the step of unloading the first intimate fiber blend (2') from the respective bin (3) onto the belt (4) comprises the step of:

- unloading the first intimate fiber blend (2') from the respective bin (3) onto the conveyor belt (21),

and wherein the step of transferring the first intimate fiber blend (2') from the belt (4) to the carding station (5) comprises the steps of:

- transporting, by the conveyor belt (21), the first intimate fiber blend (2') to the extractor belt (22),
- extracting, by the extractor belt (22), the first intimate fiber blend (2') from the conveyor belt (21) and transferring the first intimate fiber blend (2') onto the hooked loading belt (23),
- transporting, by the hooked loading belt (23), the first intimate fiber blend (2') to the hooked unloading belt (25),
- extracting, by the hooked unloading belt (25), the first intimate fiber blend (2') from the hooked loading belt (23) and unloading the first intimate fiber blend (2') to the carding station (5).

3. A method according to claim 2, wherein the belt (4) further comprises a hooked meter belt (24) positioned at the hooked loading belt (23), at an end of the hooked loading belt (23) opposite to the extractor belt (22),
wherein the step of transferring the first intimate fiber blend (2') from the belt (4) to the carding station (5) comprises the step of:

- leveling, by the hooked meter belt (24), the thickness of the first intimate fiber blend (2') transported by the hooked loading belt (23) to

the hooked unloading belt (25).

4. A method according to claim 2, wherein the system (1) comprises, in sequence, a first photocell (26), a second photocell (27), a third photocell (28), and a fourth photocell (29), wherein:

- the first photocell (26) is positioned at an end of the conveyor belt (21) facing the extractor belt (22),
- the second photocell (27) is positioned at the extractor belt (22),
- the third photocell (28) is positioned at an end of the hooked loading belt (23) facing the extractor belt (22),
- the fourth photocell (29) is positioned at the hooked loading belt (23), above the third photocell (28),

wherein the first, second, third and fourth photocells (26, 27, 28, 29) are configured to detect the presence or absence of an intimate fiber blend (2) or residuals of intimate fiber blend (2) on the respective belt (21, 22, 23, 25) at which they are positioned,
and wherein the step of transferring the first intimate fiber blend (2') from the belt (4) to the carding station (5) comprises the following steps:

- when the fourth photocell (29) detects the presence of an intimate fiber blend (2) or residuals of intimate fiber blend (2) on the hooked loading belt (23), the hooked loading belt (23) continues rotating and transferring the intimate fiber blend (2) to the carding station (5), while the conveyor belt (21) is stopped;
- when the fourth photocell (29) does not detect the presence of an intimate fiber blend (2) or residuals of intimate fiber blend (2) on the hooked loading belt (23), the conveyor belt (21) and the extractor belt (22) are actuated so as to load a further intimate fiber blend (2) or further residuals of intimate fiber blend (2) onto the hooked loading belt (23) until the fourth photocell (29) again detects the presence of an intimate fiber blend (2) or residuals of intimate fiber blend (2) on the hooked loading belt (23);
- when the first photocell (26) no longer detects the presence of an intimate fiber blend (2) or residuals of intimate fiber blend (2) on the conveyor belt (21), the extractor belt (22) and the hooked loading belt (23) continue rotating, and optionally the conveyor belt (21) is stopped;
- when the second photocell (27) no longer detects the presence of an intimate fiber blend (2) or residuals of intimate fiber blend (2) on the extractor belt (22), the hooked loading belt (23) continues rotating so as to complete the transfer of the intimate fiber blend (2) to the carding station (5), and optionally the extractor belt (22) is stopped;
- when also the third photocell (28) no longer detects the presence of an intimate fiber blend (2) or residuals of intimate fiber blend (2) on the hooked loading belt (23), the substantial complete transfer of the intimate fiber blend (2) to the carding station (5) is determined and another cycle begins.

5. A method according to claim 4, wherein the system (1) comprises a movable thrust wall (15) positioned at the conveyor belt (21) and configured to translate in a direction parallel to the conveyor belt (21) towards the extractor belt (22), from a stroke start position to a stroke end position, and vice versa, wherein the stroke end position is positioned substantially at the first photocell (26),
wherein the step of transferring the first intimate fiber blend (2') from the belt (4) to the carding station (5) comprises the following steps:

- when the fourth photocell (29) detects the presence of an intimate fiber blend (2) or residuals of intimate fiber blend (2) on the hooked loading belt (23), the hooked loading belt (23) continues rotating while the conveyor belt (21) and the movable thrust wall (15) are stopped;
- when the fourth photocell (29) does not detect the presence of an intimate fiber blend (2) or residuals of intimate fiber blend (2) on the hooked loading belt (23), the thrust wall (15) is translated in the direction of the stroke end position and the conveyor belt (21) and the extractor belt (22) are actuated so as to load a further intimate fiber blend (2) or further residuals of intimate fiber blend (2) onto the hooked loading belt (23) until the fourth photocell (29) again detects the presence of an intimate fiber blend (2) or residuals of intimate fiber blend (2) on the hooked loading belt (23);
- when the first photocell (26) no longer detects the presence of an intimate fiber blend (2) or residuals of intimate fiber blend (2) on the conveyor belt (21), the movable thrust wall (15) has reached the stroke end position, and the extractor belt (22) and the hooked loading belt (23) continue rotating;

- when the second photocell (27) no longer detects the presence of an intimate fiber blend (2) or residuals of intimate fiber blend (2) on the extractor belt (22), the hooked loading belt (23) continues rotating so as to complete the transfer of the intimate fiber blend (2) to the carding station (5);
- when also the third photocell (28) no longer detects the presence of an intimate fiber blend (2) or residuals of intimate fiber blend (2) on the hooked loading belt (23), the substantial complete transfer of the intimate fiber blend (2) to the carding station (5) is determined and the movable thrust wall (15) returns to the stroke start position, and the second intimate fiber blend (2") is unloaded from the respective bin (3) onto the conveyor belt (21).

6. A method according to claim 3, wherein the rotation speed of the hooked loading belt (23) is adjusted as a function of the amount of intimate fiber blend (2) on the belt (4), and wherein a decrease in the amount of intimate fiber blend (2) on the belt (4) corresponds to an increase in the rotation speed of the hooked loading belt (23), and vice versa, an increase in the amount of intimate fiber blend (2) on the belt (4) corresponds to a decrease in the rotation speed of the hooked loading belt (23),
and/or wherein the rotation speed of the hooked loading belt (23) is inversely proportional to the rotation speed of the hooked meter belt (24), and wherein a decrease in the amount of intimate fiber blend (2) on the belt (4) corresponds to an increase in the rotation speed of the hooked loading belt (23) and a related decrease in the rotation speed of the hooked meter belt (24), and vice versa, an increase in the amount of intimate fiber blend (2) on the belt (4) corresponds to a decrease in the rotation speed of the hooked loading belt (23) and a related increase in the rotation speed of the hooked meter belt (24).

7. A method according to claim 2, wherein the system (1) comprises a metering device (6), preferably an electronic scale, configured to receive portions of intimate fiber blend (2) from the hooked unloading belt (25), meter and transfer the portions of intimate fiber blend (2) to the carding station (5),

wherein the step of transferring the first intimate fiber blend (2') from the belt (4) to a carding station (5) comprises the steps of:

- gradually depositing a plurality of portions of the first intimate fiber blend (2') on the metering device (6) over an actual time interval so as to obtain a predefined intimate fiber blend dose (7) having a predefined weight;
- transferring the predefined intimate fiber blend dose (7) from the metering device (6) to the carding station (5) at the end of a cycle time interval;

where the actual time interval is less than the cycle time interval,
and optionally:

- determining a threshold time interval, where the threshold time interval is less than the cycle time interval and greater than the actual time interval, and preferably the threshold time interval is between 50% and 99% of the cycle time,
- determining a minimum threshold time interval and a maximum threshold time interval, both less than the threshold time interval, and where the minimum threshold time interval is less than the maximum threshold time interval,
- monitoring that the actual time interval is less than the threshold time interval,
- when the actual time interval is equal to or greater than the maximum threshold time interval, the rotation speed of the hooked loading belt (23) is increased;
- vice versa, when the actual time interval is equal to or less than the minimum threshold time interval, the rotation speed of the hooked loading belt (23) is decreased.

8. A method according to claim 7, wherein the system (1) comprises at least one barrier gate (30) interposed between the hooked unloading belt (25) and the metering device (6),
wherein the step of transferring the first intimate fiber blend (2') from the belt (4) to a carding station (5) comprises the steps of:

- keeping the barrier gate (30) open during the actual time interval so as to allow the formation of the predefined intimate fiber blend dose (7) on the metering device (6);
- closing the barrier gate (30) upon the completion of the formation of the predefined intimate fiber blend dose (7), at the end of the actual time interval, so as to prevent further residuals of intimate fiber blend (2) from depositing on the metering device (6),
- preferably transferring the predefined intimate fiber blend dose (7) contained in the metering device (6) to the carding station (5) by opening an openable bottom (14) of the metering device (6) at the end of the cycle time interval.

9. A method according to any one of the preceding claims, wherein the step of loading the plurality of

intimate fiber blends (2) into respective containment bins (3) so that each bin (3) contains a single intimate fiber blend (2), comprises:

- providing a pneumatic supply system (8), comprising a supply duct (9) connected to a carriage (10) and a pneumatic pumping system comprising a fan (13) and a cyclone (16), wherein the cyclone (16) is interposed between the bin (3) and the fan (13) and is configured to slow down the intimate fiber blend (2) conveyed by the fan (13) and expel excess air conveyed by the fan (13),
wherein the pneumatic pumping system is configured to convey a pneumatic flow into the supply duct (9);
- translating the supply duct (9), by the carriage (10), to a given bin (3) intended to receive the related intimate fiber blend (2);
- inserting the related intimate fiber blend (2) into the supply duct (9) so as to convey the intimate fiber blend (2) into the cyclone (16) and then loading the related intimate fiber blend (2) into the respective bin (3) by means of a pneumatic flow conveyed by the fan (13) of the pneumatic pumping system,
and/or
- determining, by a sensor system, preferably optical sensors, the complete emptying of a given bin (3) to be loaded with a new intimate fiber blend (2);
- loading the new intimate fiber blend (2) into the empty bin (3),
and/or
- determining, by an electronic processing unit (11), the given intimate fiber blend (2) to be loaded into the respective bin (3) based on a programmable loading sequence determined by the electronic processing unit (11).

10. A method according to any one of the preceding claims, wherein the step of unloading the intimate fiber blend (2) from the respective bin (3) onto the belt (4) comprises:

- determining, by the electronic processing unit (11) of the system (1), the given intimate fiber blend (2) to be unloaded based on a programmable unloading sequence determined by the electronic processing unit (11),
and/or
- providing bins (3) comprising an openable bottom gate (12) and a pneumatic pumping system, respectively;
- opening the bottom gate (12) of the respective bin (3) containing the respective intimate fiber blend (2) to be unloaded and pumping a pressurized air flow into the given bin (3), in a direction exiting the bottom gate (12) so as to unload the intimate fiber blend (2) exiting from the bin (3);
and optionally,
- detecting the complete emptying of the bin (3) by means of a sensor system, preferably optical sensors,
and optionally,
- providing a suction hopper (31) and sucking air from the system (1) so as to decrease the turbulence generated by unloading the intimate fiber blend (2) from the bin (3) to the belt (4).

11. A method according to any one of the preceding claims, wherein the step of spinning the thread of the shaded carded rovings (19) comprises the step of:

- detecting, by preferably optical sensors, the possible breakage of the roving (19) or shaded carded yarn (20) and stopping the spinning of the roving (19) at the possible breakage of the roving or shaded carded yarn (20);
and/or
- monitoring and adjusting, by the electronic processing unit (11), the carding of the one or more different intimate fiber blends (2) so as to even the thickness of the shaded carded web produced by the carding station (5);
and/or
- after the carding, cleaning the carding station (5) of any residuals of intimate fiber blends (2), preferably by means of compressed air cleaners or blowers.

12. A system (1) for obtaining a shaded carded yarn, comprising:

- a plurality of containment bins (3) configured to contain a respective intimate fiber blend (2);
- a belt (4) configured to receive the intimate fiber blends (2) unloaded from the respective bins (3);
- a carding station (5) positioned downstream of the belt (4) and configured to receive the intimate fiber blends (2) from the belt (4), wherein the carding station (5) is configured to card the one or more intimate fiber blends (2) transferred to the carding station (5) so as to obtain a shaded carded web;
- means for determining the complete transfer of the first intimate fiber blend (2') from the belt (4) to the carding station (5) and the absence of residuals of the first intimate fiber blend (2') on the belt (4);
- a cutting station (17) configured to cut the shaded carded web so as to obtain a plurality of rovings (19) of shaded carded thread;

- a spinning frame (18) configured to spin the thread of the shaded carded rovings (19), preferably by drawing or twisting the thread, so as to obtain a shaded carded yarn (20);
- optionally, a winding station configured to wind the shaded carded yarn (20) so as to obtain a plurality of spools of shaded carded yarn.

13. A system (1) according to claim 12, wherein the belt (4) comprises, in sequence, a conveyor belt (21), an extractor belt (22), a hooked loading belt (23), and a hooked unloading belt (25),

wherein the system (1) is configured to unload the first intimate fiber blend (2') from the respective bin (3) onto the conveyor belt (21),
wherein the extractor belt (21) is configured to transport the first intimate fiber blend (2') to the extractor belt (22),
wherein the extractor belt (22) is configured to extract the first intimate fiber blend (2') from the conveyor belt (21) and transfer the first intimate fiber blend (2') onto the hooked loading belt (23),
wherein the hooked loading belt (23) is configured to the first intimate fiber blend (2') to the hooked unloading belt (25),
wherein the hooked unloading belt (25) is configured to extract the first intimate fiber blend (2') from the hooked loading belt (23) and unload the first intimate fiber blend (2') to the carding station (5).

14. A system (1) according to claim 13, wherein the belt (4) further comprises a hooked meter belt (24) positioned at the hooked loading belt (23), at an end of the hooked loading belt (23) opposite to the extractor belt (22),

and wherein the hooked meter belt (24) is configured to level the thickness of the first intimate fiber blend (2') transported by the hooked loading belt (23) to the hooked unloading belt (25),
and wherein preferably the hooked unloading belt (25) is configured to rotate in a direction opposite to the rotation direction of the hooked loading belt (23),
and/or to rotate at a greater speed than the hooked loading belt (23),
and/or wherein the hooked loading belt (23) and the hooked unloading belt (25) are positioned with respect to each other and configured so that the hooks of the hooked unloading belt (25) intersect with the hooks of the hooked loading belt (23),
and/or wherein the extractor belt (22) is configured to rotate in the same direction as the conveyor belt (21),
and/or wherein the extractor belt (22) is configured to rotate at a speed from two to five times greater than the rotation speed of the conveyor belt (21).

15. A system (1) according to claim 13 comprising, in sequence, a first photocell (26), a second photocell (27), a third photocell (28), and a fourth photocell (29), wherein:

- the first photocell (26) is positioned at an end of the conveyor belt (21) facing the extractor belt (22),
- the second photocell (27) is positioned at the extractor belt (22),
- the third photocell (28) is positioned at an end of the hooked loading belt (23) facing the extractor belt (22),
- the fourth photocell (29) is positioned at the hooked loading belt (23), above the third photocell (28), and optionally the fourth photocell (29) is movable in height with respect to the third photocell (28),

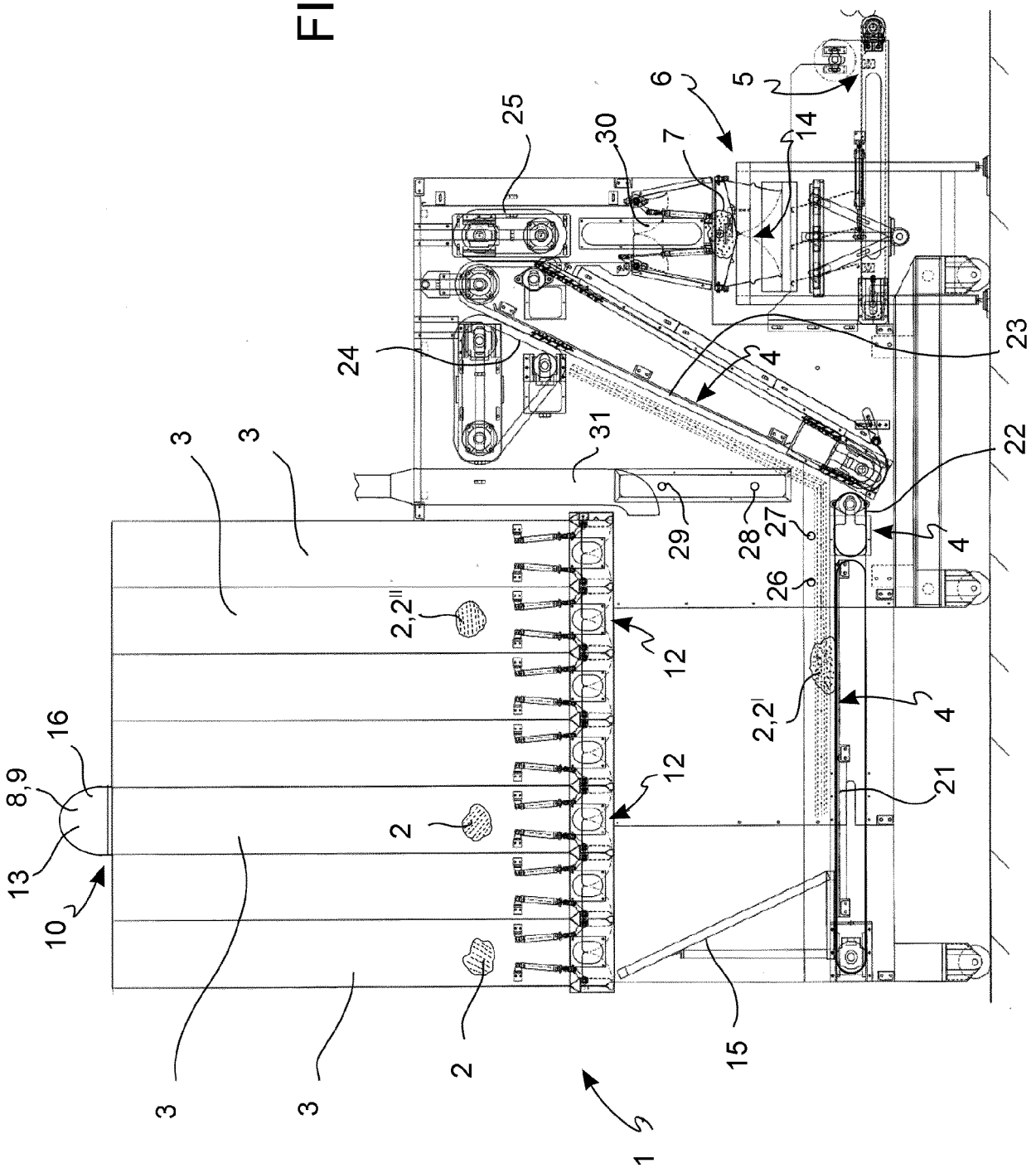
wherein the first, second, third and fourth photocells (26, 27, 28, 29) are configured to detect the presence or absence of an intimate fiber blend (2) or residuals of intimate fiber blend (2) on the respective belt (21, 22, 23, 25) at which they are positioned,
and wherein the conveyor belt (21), the extractor belt (22), the hooked loading belt (23), and the hooked unloading belt (25) are configured to be selectively movable depending on the detection of the presence or absence of an intimate fiber blend (2) or residuals of intimate fiber blend (2) by the first and/or second and/or third and/or fourth photocells (26, 27, 28, 29),
and optionally comprising a movable thrust wall (15) positioned at the conveyor belt (21) and configured to translate in a direction parallel to the conveyor belt (21) towards the extractor belt (22), from a stroke start position to a stroke end position, and vice versa, wherein the stroke end position is positioned substantially at the first photocell (26),
and wherein the movable thrust wall (15) is configured to be selectively movable depending on the detection of the presence or absence of an intimate fiber blend (2) or residuals of intimate fiber blend (2) by the first and/or second and/or third and/or fourth photocells (26, 27, 28, 29),
and optionally comprising:

- preferably optical sensors configured to detect the possible breakage of the

roving or shaded carded yarn (20), and locking means configured to stop the spinning of the rovings (19) upon the possible breakage of the roving or shaded carded yarn (20) detected by the sensors;
and/or
- compressed air cleaners or blowers configured to clean the carding station (5) of any residuals of intimate fiber blends (2) after carding;

and/or wherein an electronic processing unit (11) is configured to monitor and adjust the carding of the one or more different intimate fiber blends (2) so as to even the thickness of the shaded carded web produced by the carding station (5).

FIG. 1


1
2
2,2I
2,2II
3
4
5
6
7
8,9
10
12
13
14
15
16
21
22
23
24
25
26
27
28
29
30
31

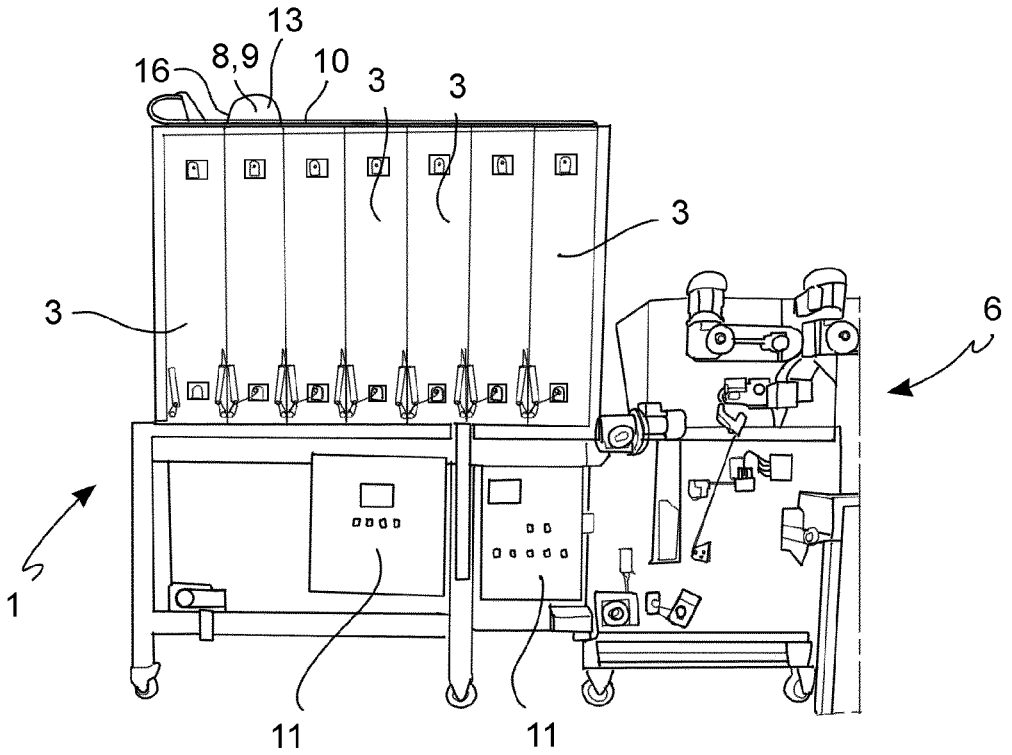


FIG. 2

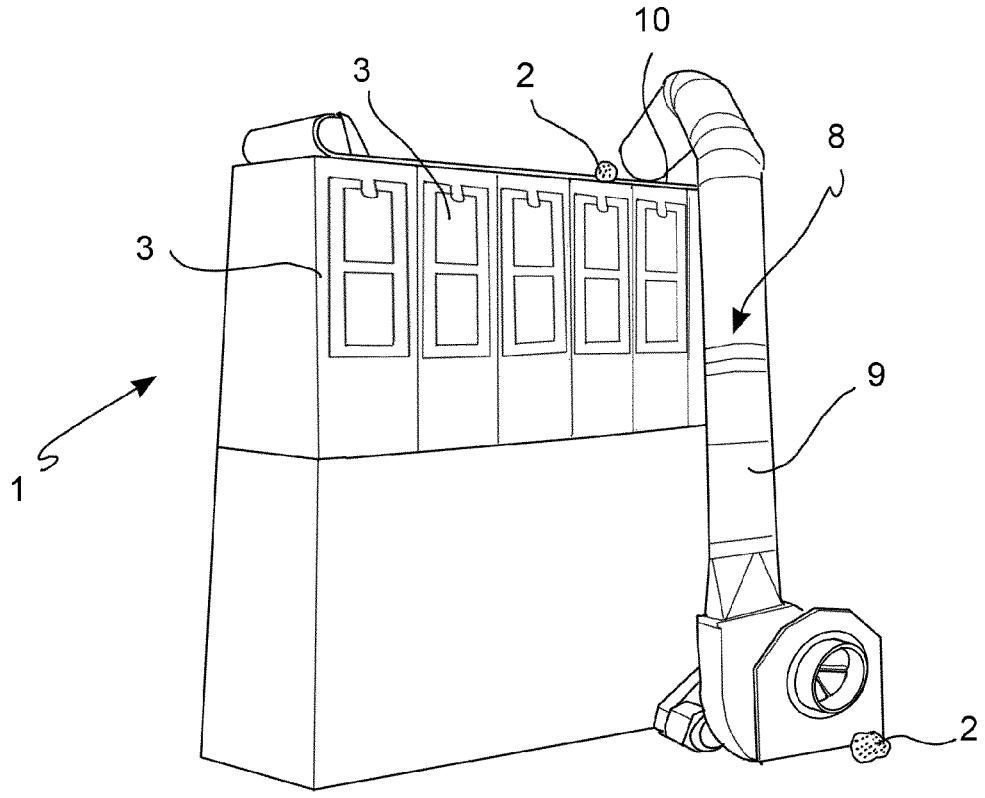


FIG. 3

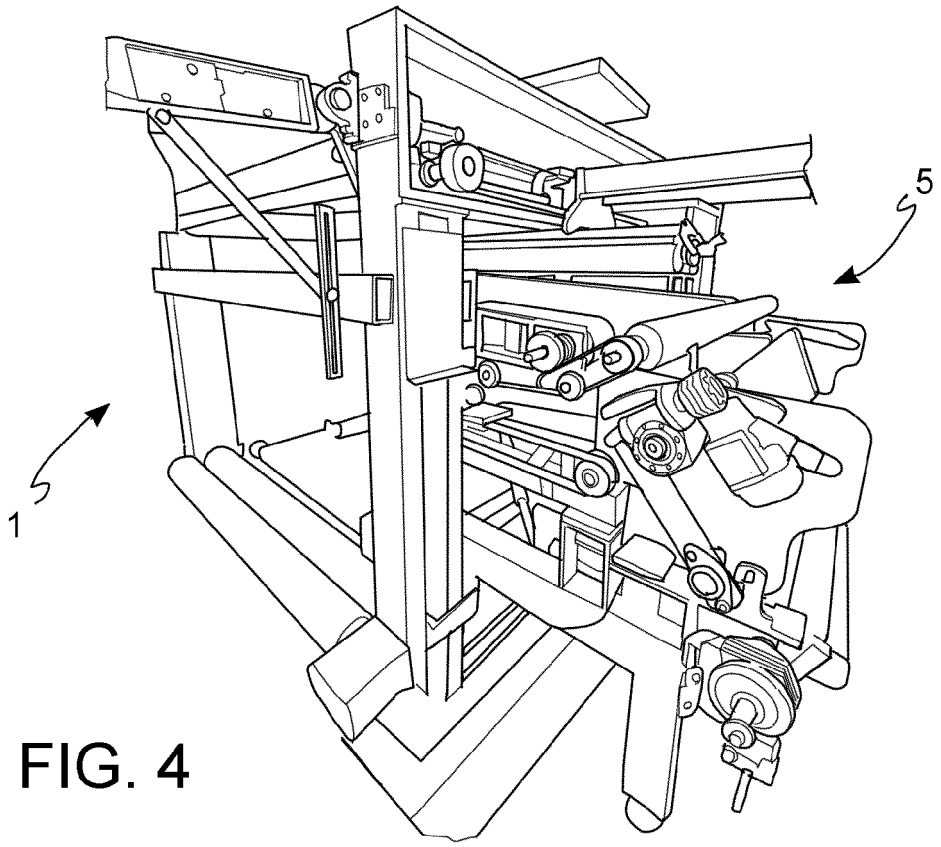


FIG. 4

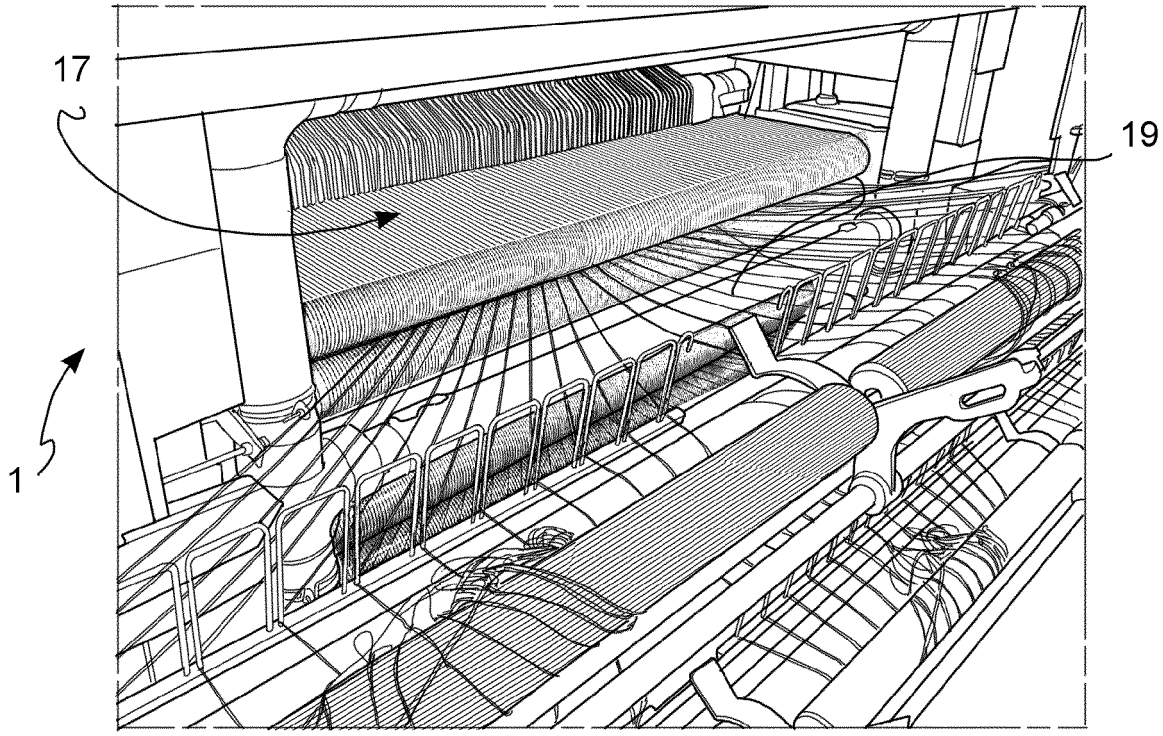


FIG. 5

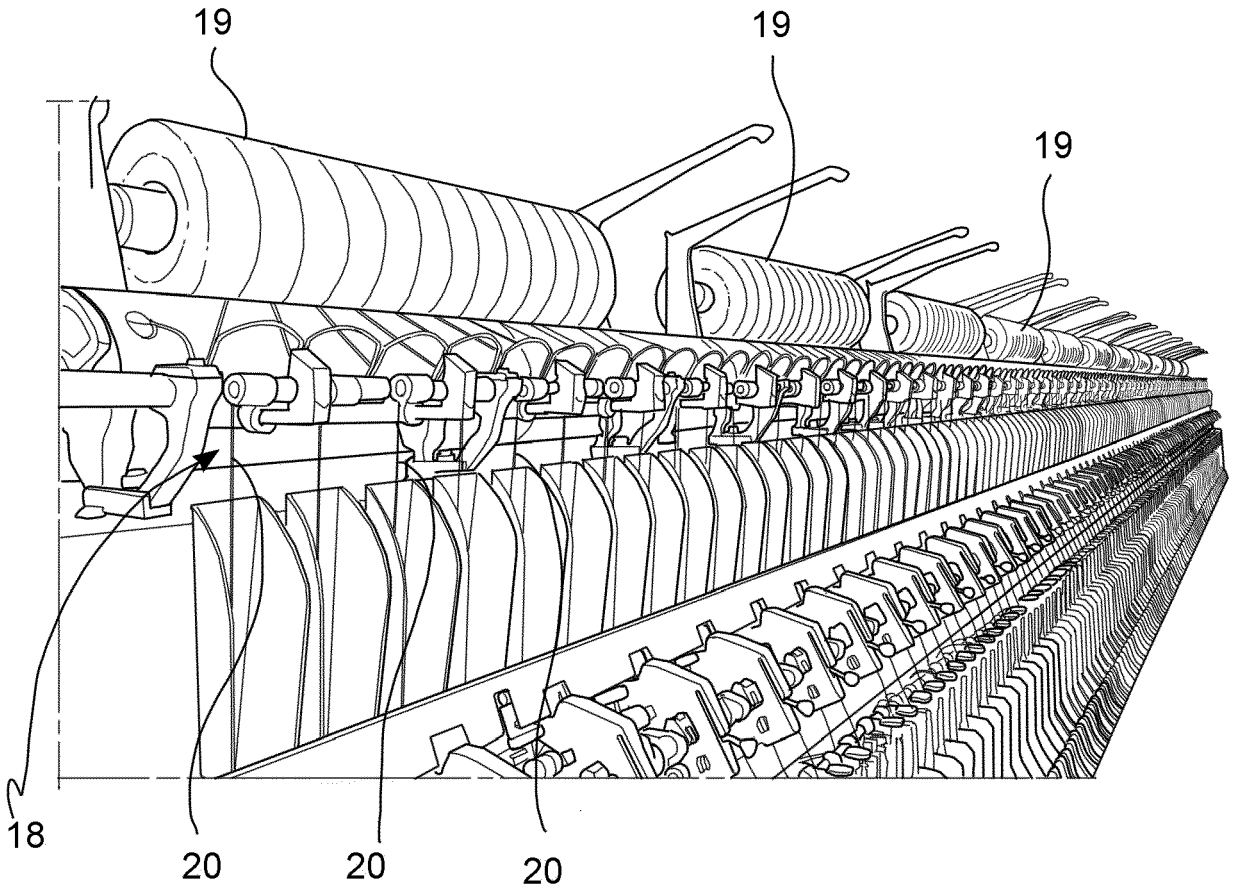


FIG. 6

Europäisches Patentamt
European Patent Office
Office européen des brevets

EUROPEAN SEARCH REPORT

Application Number
EP 24 17 4888

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
Y	DE 91 16 319 U1 (TRUETZSCHLER GMBH & CO KG) 20 August 1992 (1992-08-20)	1,12	INV. D01G15/40 D01G23/04 D02G3/04 D01G13/00 D01G15/52 D01G21/00
A	* the whole document *	2-11, 13-15	
Y	FR 2 874 625 A1 (TRUETZSCHLER & CO [DE]) 3 March 2006 (2006-03-03) * the whole document *	1,12	
Y	JP S48 36424 A (UNKNOWN) 29 May 1973 (1973-05-29) * paragraph [0002] * * figure 1 *	1,12	

TECHNICAL FIELDS SEARCHED (IPC)

D01G
D02G

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	23 September 2024	Humbert, Thomas

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)

ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 24 17 4888

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.

23-09-2024

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
DE 9116319 U1	20-08-1992	NONE	
FR 2874625 A1	03-03-2006	CN 1743520 A	08-03-2006
		DE 102004042443 A1	02-03-2006
		FR 2874625 A1	03-03-2006
		GB 2417494 A	01-03-2006
		US 2006054460 A1	16-03-2006
JP S4836424 A	29-05-1973	JP S4836424 A	29-05-1973
		JP S5227727 B2	22-07-1977

EPO FORM P0459

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