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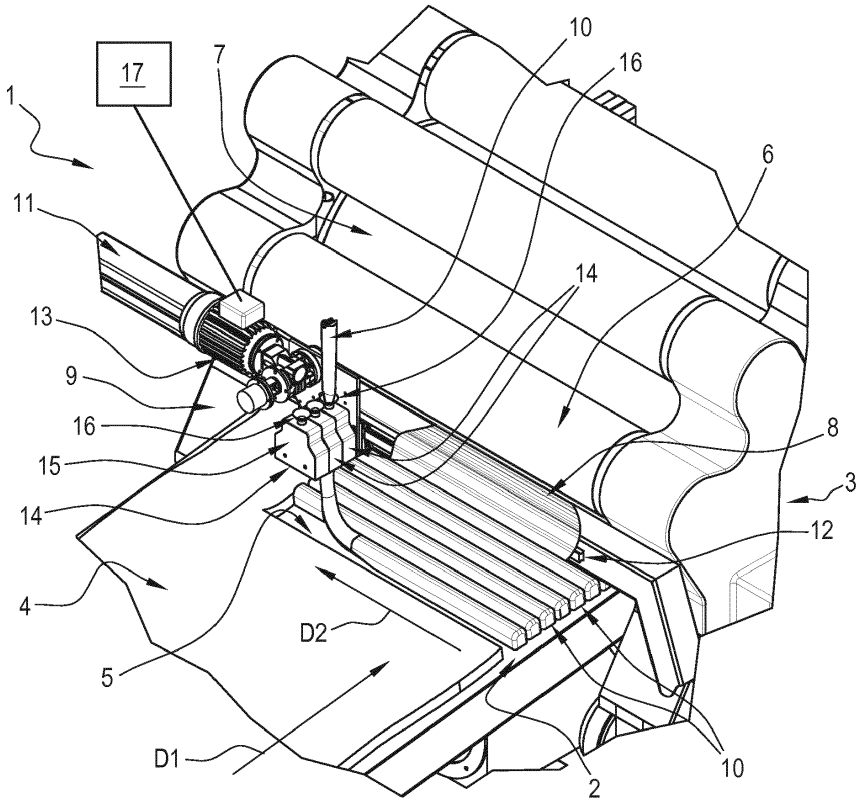
(54) METHOD FOR WOOLLEN CARDING AND RELATIVE PLANT

(57) Described is a method for woollen carding comprising the steps of preparing a web (4) of textile fibres made with a first type of textile fibres, feeding the web (4), along a first predetermined rectilinear direction (D1) on a respective conveyor belt (2); preparing at least one tape (10) of textile fibres made with a second type of textile fibres different from the first type of fibres of the web (4); placing, on the web (4), the tape (10) according to a second direction (D2) transversal to the first direction (D1). [FIGURE 2]

FIG. 2



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Description

[0001] This invention relates to a method for carding.

[0002] More specifically, the invention relates to a method for woollen carding, designed for the carding of textile fibres of various kinds.

[0003] The invention also relates to a plant for carding textile fibres.

[0004] The woollen carding is an operation required for preparation of the yarn and essentially comprises disentangling the textile fibres and making them parallel so as to allow an easy spinning.

[0005] The textile fibres which can be used are natural, artificial or synthetic fibres. Moreover, these fibres can be used pure or mixed with each other.

[0006] By way of example, the natural fibres include wool, from which, for historical reasons, this type of carding derives the relative name.

[0007] Woollen carding constitutes a fundamental operation of the carded spinning cycle, by which, after suitable treatments, including, for example, a washing, the twists of fibre open and untangle, eliminating any impurities contained in them.

[0008] The carding process, although originally carried out manually, has for many years been mechanised by the adoption of special carding rollers.

[0009] In a short, the textile fibre is made to pass through a series of rotating cylinders provided with needles or teeth, where it is separated and freed from the impurities present and its fibres are all oriented in the same direction.

[0010] In detail, even today, a carding plant normally comprises a plurality of machines (known as "cards") positioned in series and grouped together in so-called 'assortments'.

[0011] The card consists of two large rotary cylinders (drum and comb) equipped with metal teeth of suitable fineness and number, adjusted with respect to each other to a few hundredths of a millimetre (from 40 to 15 mm progressively), auxiliary carding elements (workers and twisters) and several other auxiliary elements (flywheel, over-flywheel, under-flywheel, inlets, *rouletabosse*).

[0012] The fibres pass through these two mobile surfaces equipped with needles, to be disentangled and oriented, until they reduce, in successive passes, into a web of parallel fibres which is transformed into a carded tape (flat) and then into a sliver (cylindrical) in the last part of the so-called "divider" machine.

[0013] The described architecture of plant, although split into some limited variants, is already well established.

[0014] Over the years, the main improvements made to the carding process and to the respective machines used in it have concentrated in particular on safety issues, in view of the hazards to which the operators were exposed. Manipulation of the webs, their introduction into the cards as well as the frequent cleaning of the fibre residue from the rotary drums of exposed the operators carrying out these activities to the high risk of accidents due to the proximity to mechanical moving components.

[0015] Efforts were therefore concentrated on reducing the risks for the operators and also, obviously, on increasingly productive plants but this has given rise, on the other hand, to a substantial inactivity with regard to product innovations.

[0016] In other words, the carding plants currently available on the market, although having an improved degree of safety for the operators and an excellent productivity, do not allow specific modifications to the yarn produced by them.

[0017] This need is also particularly felt currently since designers always request new fabrics.

[0018] There are increasing demands, for example, for non-uniform yarns, that is to say, non-uniformity both in terms of colour, composition and size.

[0019] With reference to this latter feature, it is worth noting, for example, the so-called streaked yarn, that is to say, a yarn with irregular enlargements, in the shape of a torpedo, which form due to a technical defect on the yarn. If these enlargements are deliberately created at programmed intervals, streaked yarns are obtained for knitwear and fabrics, such as, for example, the sought-after "shantung".

[0020] Yarns having the above-mentioned irregularities are not, with the prior art plants, easy to make since they are achieved by roughly feeding fibres of different types to the carding machine.

[0021] Further, the effects of this process, since they largely depend on the particular the case, are not easily reproducible, thereby preventing designers from having products with the same features in a continuous manner.

[0022] The aim of this invention is to provide a method and a plant for woollen carding which overcomes the above-mentioned drawbacks and which is at the same time practical to implement.

[0023] A further aim of the invention is to provide a carding method and plant which guarantees a high level of safety for the operator.

[0024] Another aim of this invention is to provide a carding plant which is effective and compact.

[0025] The technical features of the invention, with reference to the above aims, are clearly described in the claims below and its advantages are more apparent from the detailed description which follows, with reference to the accompanying drawings which illustrate a preferred, non-limiting embodiment of the invention by way of example and in which:

- Figure 1 is a schematic perspective view, with some parts in cross-section and others cut away, of a preferred embodiment of the plant according to the invention;
- Figure 2 is an enlarged view, with some parts cut away in order to better illustrate others, of a detail of Figure 1.

[0026] As illustrated in the accompanying drawings, the numeral 1 denotes in its entirety a woollen carding plant made in accordance with the invention.

[0027] The carding plant 1 is designed to be integrated in a line for spinning wool, of the substantially known type and not illustrated.

[0028] The carding plant 1 comprises a conveyor belt 2 and a carding station 3.

[0029] The conveyor belt 2 extends longitudinally along a first predetermined rectilinear direction D1 and feeds a web 4 of textile fibres to the carding station 3, along the first direction D1.

[0030] The web 4 of textile fibres is fed by the belt 2 in the direction of the arrow D1 shown in Figure 2.

[0031] Advantageously, the carding station 3 is of the so-called "dividing" type, that is, designed to form, at the outlet from the plant, a plurality of slivers, not illustrated, from which are made, in known manner, the same number of yarns. More specifically, the web 4 of fibres is transformed in the "divider" into strips (flat carded web) and then, in the last part, into sliver (cylindrical).

[0032] The web 4 is made with a first type of textile fibres, that is to say, with textile fibres of predetermined and defined characteristics, such as the composition, colour and consistency.

[0033] The textile fibres constituting the web 4 are advantageously natural, artificial or synthetic fibres, and can be, without distinction, either pure or mixed together.

[0034] The natural fibres include, by way of example, wool.

[0035] A gap 5 with a predetermined shape is advantageously made on the web 4.

[0036] As will be described in more detail below, the shape and the extent of the gap 5 depend on the operational choices made and may vary as a function of the yarn to be obtained.

[0037] By way of example, as illustrated in the accompanying drawings, the carding station 3 comprises a first working cylinder 6 and a carding drum 7 having axes of rotation parallel with one another and with a second direction D2 transversal to the above-mentioned first predetermined direction D1.

[0038] Advantageously, the direction D2 lies on the same plane on which the predetermined direction D1 lies.

[0039] The carding station 3 also comprises a cylinder 8 for introducing inside the station 3 textile fibres supported and fed by the conveyor belt 2.

[0040] Upstream of the above-mentioned introducing cylinder 3 in the direction of the arrow D1 of Figure 2, the plant 1 comprises a unit 9 for feeding tapes of fibres, of which only one is illustrated in the drawing and labelled 10, made with respective types of fibres different from each other and from the first type which characterises the web 4 fed from the conveyor belt 2.

[0041] The term tape is used to mean, for the purposes of this invention, a tape of textile fibres having a consistency comparable to that of the web 4.

[0042] More specifically, the tape 10 comprises artificial, natural or synthetic fibres, which can be, without distinction, pure or mixed together, which are compatible with the fibres which constitute the web 4 or other tapes 10 for the purpose of obtaining a yarn.

[0043] The plant 1 has a structure 11 for supporting the feed unit 9, the structure 11 extending above the conveyor belt 2 and being shaped like a bridge.

[0044] A track 12 extends along the supporting structure 11 according to the above-mentioned second transversal direction D2.

[0045] The above-mentioned feed unit 9 is slidably engaged on the track 12.

[0046] The unit 9 comprises a motor element 13 designed to move, with a substantially known method and not further described, the unit 9 along the above-mentioned track 12 according to the direction D2.

[0047] As illustrated in Figure 2, the unit 9 for feeding the tape 10 comprises, arranged side by side, three means 14 for dispensing the tape 10.

[0048] In Figure 2, provided purely by way of a non-limiting example and for needs of clarity, only one of the three dispensing means 14 is engaged with a respective tape 10.

[0049] Each dispensing means 14 comprises a central body 15 and, above the latter, a conveyor funnel 16.

[0050] The conveyor funnel 16 receives the tape 10 coming from a storage element, not illustrated, and conveys it inside the central body 15.

[0051] Means, not illustrated, designed for forward movement of the tape are housed inside the central body 15.

[0052] The above-mentioned and not illustrated forward movement means advantageously comprise two counter-rotating rollers of which at least one is motor driven and between which the tape 10 is engaged.

[0053] In other words, the tape 10 coming from above, from the above-mentioned and not illustrated storage elements, and engaged in the respective dispensing means 14, is fed in a regulated manner towards the convenor belt 2 by the above-mentioned and not illustrated forward movement means.

[0054] The unit 9 also comprises, for each dispensing means 14, respective means for cutting the tape 10, not shown in the accompanying drawings, located downstream of the above-mentioned forward movement means, in the feed direction of tape, as indicated in Figure 2.

[0055] Preferably, the above-mentioned and not illustrated cutting means comprise a blade designed to engage, following an appropriate command, with the tape 10 for cutting suitable pieces.

[0056] The plant 1 also comprises a computerised control unit, schematically illustrated in Figure 2 with a block 17.

[0057] The computerised unit 17 is operatively connected to the unit 9 for feeding the tape 10 and configured for controlling the movement along the track 12.

[0058] The computerised command and control unit

17, as well as controlling the above-mentioned movement along the track 12, is configured for adjusting, in combination, the dispensing of the tape 10 by the above-mentioned dispensing means 14, according to a predetermined pattern.

[0059] The predetermined pattern is advantageously recorded in a suitable memory cell of the computerised unit 17.

[0060] A description is given below of the functional aspects of the carding plant 1 described above, in accordance with a preferred use thereof.

[0061] As illustrated in Figure 2, after having prepared, with substantially known carding techniques, a web 4 of textile fibres made with a first type of textile fibres, the web 4 is fed along the above-mentioned first predetermined rectilinear line D1, on the conveyor belt 2.

[0062] Again with reference to Figure 2, a gap 5 is made on the web 4 by removing a predetermined quantity of fibres of the web 4.

[0063] In other words, the gap 5 is defined by removing a portion of the web 4. The shape and the extent of the gap 5 depend, as already mentioned above, on operational decisions taken as a function of the result to be obtained on the yarn.

[0064] The gap 5 is made alternatively either manually or automatically, with suitable means, not illustrated, configured for the cutting and the removal of certain portions of web 4.

[0065] With the movement of the conveyor belt 2 (advantageously looped around two rollers of which at least one is motor driven) there is a consequent feeding of the web 4 along the direction D1 and, due to this movement, the gap 5 is located at the unit 9 for feeding the tape 10 positioned upstream of the carding station 3.

[0066] The feed unit 9, through the relative dispensing means 14, deposits the tape 10 on the conveyor belt 2 for filling the gap 5.

[0067] In other words, the tape 10 at the outfeed of the dispensing means 14 is placed, by gravity, that is to say, due to the force of gravity, on the underlying conveyor belt 2, inside the gap 5.

[0068] For this purpose, that is to say, for placing the tape 10 on the gap 5 in a distributed and uniform manner, the feed unit 9 is moved along the track 12 by activating the motor element 13.

[0069] The computerised command and control unit 17 synchronises the movement of the feed unit 9 along the second direction D2 with the action of feeding the gap caused by the suitable means, not illustrated, located inside the central body 15 of the dispensing means 14.

[0070] For this reason, as the tape 10 is gradually fed from the respective dispensing means 14, the movement of the unit 9, and therefore the dispensing unit 14, along the direction D2 ensures that the tape 10 is positioned extended to occupy a corresponding space of the gap 5.

[0071] The computerised command and control unit 17 activates the above-mentioned and not illustrated means for cutting the tape 10 positioned on the dispensing means 14, for cutting the tape 10.

[0072] Preferably, the tape 10 is cut to the size suitable for matching, at least approximately, one relative end with the corresponding limit of the gap 5.

[0073] As the not illustrated feed means present in the dispensing means 14 gradually push a predetermined length of tape 10 towards the gap 5, an equivalent stretch of tape 10 is called from the above-mentioned and not illustrated storage elements.

[0074] By way of example, the tape 10 is advantageously wound in reels and during the consumption by the above-mentioned and not illustrated feed means, a controlled unrolling of the reels occurs.

[0075] The computerised unit 17 controls, using both a single tape 10 and different tapes 10 (that is, tapes 10 consisting of fibres of a different type), the filling of the gap 5.

[0076] In this way, the filling of the gap 5 by placing tapes 10 ensures a substantial continuity of material in the web 4 which is fed to the carding station 3.

[0077] The totality of the web 4 of fibres of the first type and the tape(s) 10 of fibres of a different type are fed by the conveyor belt 2 to the introducing cylinder 8, the first element of the carding station 3.

[0078] The carding operations are executed on the totality of web 4 and tapes 10 inside the station 3, operations which will result in, at the outlet from the station 3, the division of the above-mentioned totality into a plurality of slivers, not illustrated in the accompanying drawings.

[0079] These slivers, not illustrated, create, after suitable spinning steps, the woollen yarn.

[0080] According to alternative embodiments of the method just described which are covered by this invention, the tape 10 is also placed directly on the web 4 and not necessarily at a relative gap 5.

[0081] In this case, the density of the tape 10 must be suitably selected, also according to the result to be obtained, considering that upon entering the carding station 3 its thickness will be added to that of the web 4.

[0082] The plant and the method described above in accordance with this invention achieve the preset aims and allow the achievement of important advantages.

[0083] A first advantage connected to the invention is due to the possibility of making slivers, and therefore yarns, with a wide range of chromatic effects starting from a same web, with the simple addition of tapes of the desired colour or colours.

[0084] The presence of a plurality of dispensing means 14 positioned on the feed unit 9 also makes it possible to have as many different tapes 10, in such a way as to be able to even easily mix together the effects of the individual tapes 10.

[0085] In a similar fashion to the chromatic variability, the invention allows for the provision of an equivalent variability in terms of material used, as the tapes 10 used can be made of different types of fibres, and in terms of consistency of appearance or to touch.

[0086] Another advantage linked to the invention is due

to the fact that the introduction of the tapes occurs in the proximity of the last carding steps, that is, immediately upstream of the "divider", in such a way as to render more effective the effect of non-uniformity caused by the different fibres introduced with the tapes. If, in effect, these fibres of a different type were introduced upstream, repeated carding operations would contribute to a certain dispersion of the fibres, thereby softening the desired effects of non-uniformity.

[0087] Yet another advantage linked to the invention consists in the high degree of safety for the operators since the operation of the unit for feeding the tapes is substantially automatic and does not require a continuous intervention by the operators.

[0088] The invention is also extremely versatile since, advantageously, the operation of the unit for feeding the tapes is controlled in a computerised manner, thereby allowing a high level and articulated operation.

[0089] Advantageously, as mentioned, the shape and amplitude of the gap 5 or in any case the shape and amplitude of the zone on which the tapes 10 are placed also affects the end quality of the yarn which will consequently feel the effect of the manner (quantity, frequency) in which the fibres of different types are present in the sliver from which the yarn is formed.

Claims

1. A method for woollen carding comprising the following steps:

   - preparing a web (4) of textile fibres made with a first type of textile fibres,
   - feeding the web (4) of textile fibres of the first type along a first predetermined rectilinear direction (D1) on a respective conveyor belt (2),
   - preparing at least one tape (10) of textile fibres made with a second type of fibres different from the first type of fibres of the web (4),
   - depositing, at the web (4), the at least one tape (10) of textile fibres, according to a second direction (D2) transversal to the first predetermined direction (D1),
   - feeding the web (4) and the at least one tape (10) to a carding station (3).

2. The method according to claim 1, **characterised in that** it comprises the step of making a gap (5) on the web (4), the step of depositing the tape (10) being actuated at the gap (5).

3. The method according to claim 1 or 2, wherein the step of depositing the at least one tape (10) of fibres is actuated by a feed unit (9), **characterised in that** the step of depositing the at least one tape (10) comprises the step of moving the feed unit (9) along the second transversal direction (D2).

4. The method according to claim 3, **characterised in that** the step of feeding the web (4) of textile fibres of the first type along the first predetermined rectilinear direction (D1) and the step of moving the feed unit (9) along the second transversal direction (D2) are performed in a synchronised fashion.

5. A system for woollen carding of textile fibres comprising:

   - a carding station (3),
   - a conveyor belt (2) for feeding to the carding station (3), along a first predetermined rectilinear direction (D1), a web (4) of textile fibres made with a first type of textile fibres,
   - a unit (9) for feeding at least one tape (10) for textile fibres made with a second type of textile fibres different from the first type, the unit (9) being configured for depositing the at least one tape (10) at the web (4), according to a second direction (D2) transversal to the first predetermined direction (D1).

6. The system according to claim 5, **characterised in that** it comprises a track (12) extending parallel to the second direction (D2), the feed unit (9) being configured to slide along the track (12).

7. The system according to claim 5 or 6, **characterised in that** the feed unit (9) comprises means (14) for regulated dispensing of the tape (10).

8. The system according to any one of claims 5 to 7, **characterised in that** it comprises a computerised command and control unit (17) configured for controlling the movement of the feed unit (9) along the track (12) and, in combination, regulating the dispensing of the tape (10) by the dispensing means (14), as a function of a predetermined scheme.

9. The system according to any one of claims 5 to 8, **characterised in that** the feed unit (9) comprises means (14) for dispensing a plurality of tapes (10) made with respective types of textile fibres, different to each other and to the first type.

10. A wool spinning line, **characterised in that** it comprises a carding system according to any of claims 5 to 9.

FIG. 1

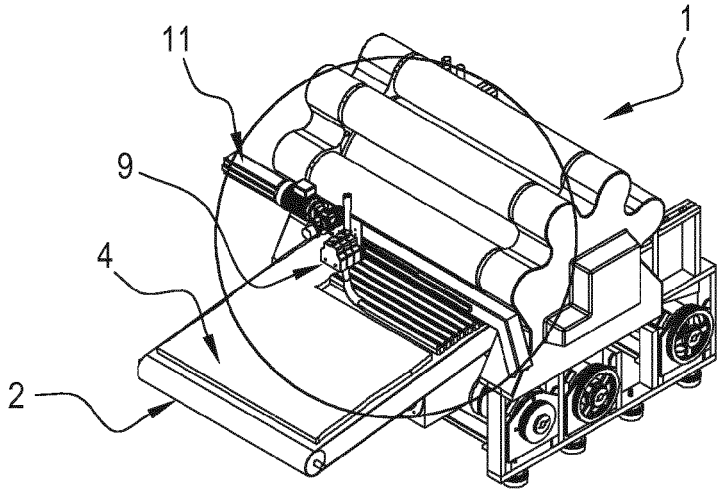
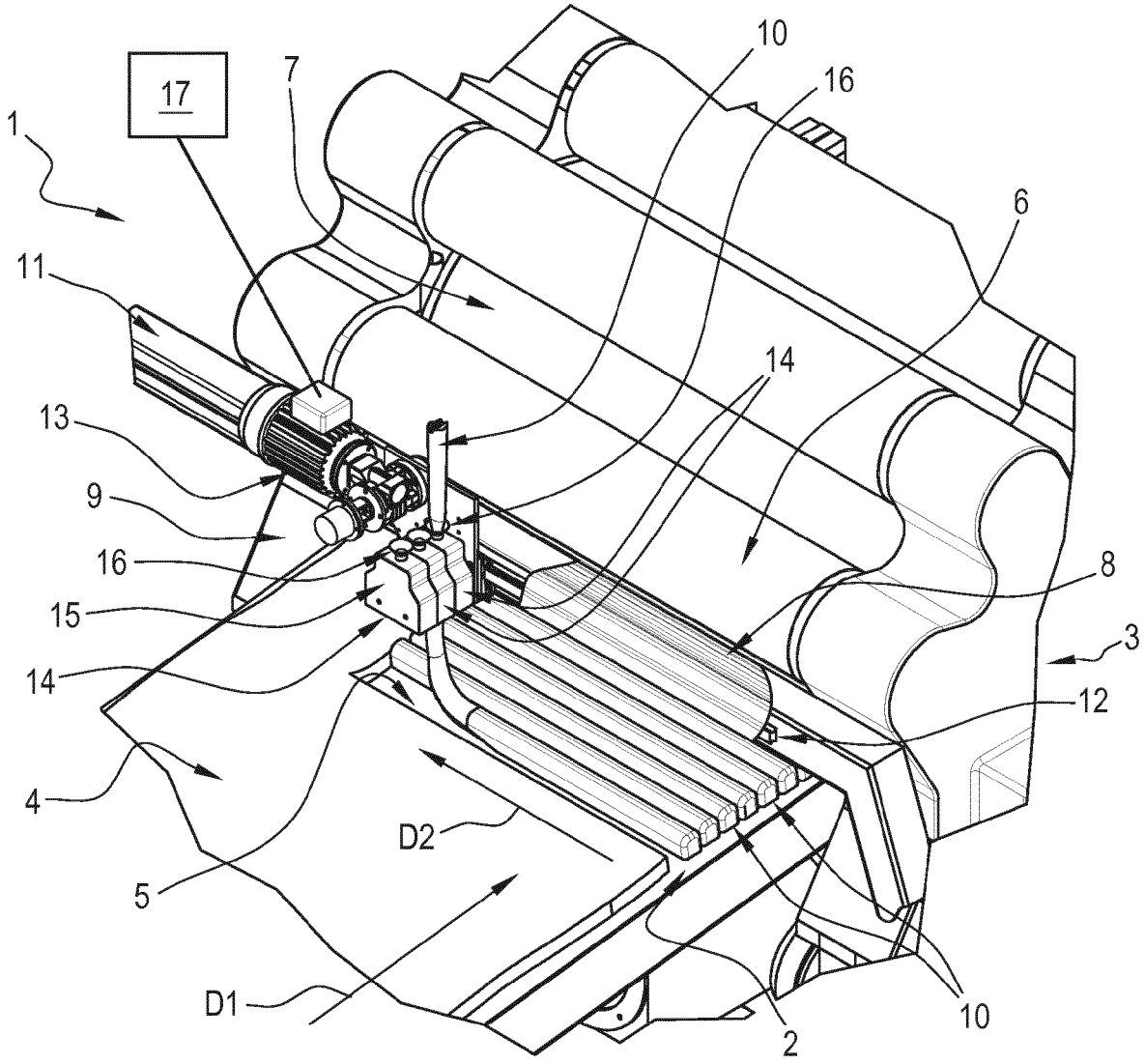


FIG. 2



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EUROPEAN SEARCH REPORT

Application Number
EP 17 20 3653

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 Y	JP H04 34034 A (SUZUKI MAKOTO) 5 February 1992 (1992-02-05) * page 2, line 2 - line 25 * * page 3, line 5 - line 10 * * page 3, line 23 - line 41 * * figures 1-8 *	1,3-10 2	INV. D01G15/40 D01G15/70
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The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	5 April 2018	Humbert, Thomas

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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