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to transfer the fabric along the feed path from a sector upstream to a sector downstream. The or each transfer system (19) is designed to reduce the torsion induced in the fabric by rotation of the sector upstream with respect to the transfer system.



Description

Technical Field

[0001] The present invention relates to a machine for processing piece goods or textile articles, for example knitted fabrics, woven fabrics, and to the relative procedure for dry, wet and in bath processing thereof, for example drying, washing, dyeing and finishing processes.

State of the Art

[0002] In the field of fabric processing and finishing, machines with baskets or rotating drums, which are similar to the domestic washing machines, are well known for dry, wet or in bath processing of textile fabrics in piece or textile articles, for example drying, washing, dyeing and finishing.

[0003] In some cases these machines are of the discontinuous type, and provide for a fabric in rope form of finished length (several tens of meters) to be fed into the machine and closed, if necessary by joining together the head and tail of the rope so as to form a sort of loop. The fabric is maintained in movement for sufficient time inside the machine to obtain the desired features and effects on the fabric. At the end of the treatment, the machine is stopped, depressurized if necessary, and opened, and the treated fabric is removed therefrom to be replaced with a new fabric to be processed.

[0004] Discontinuous machines with rotating basket are described for example in the documents US3601903, US3696643, DE3934406 and EP1702095.

[0005] These machines are used in a particularly advantageous manner for ennobling soft or particularly delicate fabrics, as during processing the fabric can move freely inside the basket without creating tensions or tractions in the fibers thereof.

[0006] Furthermore, in this way the "shrinking" effect on the fabric, both in weft and in warp, is maximum, due to the dimensional shrinkage of the fabric above all following the processing to which it is subjected.

[0007] At the same time, these machines present some drawbacks, including the drawback that they must be frequently stopped for loading and unloading of the fabric, which must be sewn in a loop, by joining the two ends of the piece together through sewing, with a consequent further increase in the time required for loading and unloading of the machine. Furthermore, the formation of knots in the fabric during treatment leads to the need for further long operations, in order to loosen said knots, which have formed in the fabric during the processing cycle, and this operation must be carried out manually by an operator. This results in great loss of productivity and high labor costs.

[0008] Furthermore, the final effect of the treatment can be impaired by the fact that random and free movement of the piece inside the rotating basket causes a natural predisposition of the fabric to form knots or con-

strictions. Furthermore, the tongues inside the basket, if present, grip the mass of the fabric in a random fashion, and this facilitates penetration of free loops by adjacent loops. The final effect of processing on the fabric is an alternation of points with complete processing and points with insufficient processing, which can be repaired by subjecting the fabric to numerous processing cycles and/or by unloading the article from the machine, loosening the knots and reloading it in the machine, as mentioned above.

[0009] Furthermore, the finishing effect between one process and the other cannot be controlled or repeated in an accurate manner, as is instead increasingly required by the market.

[0010] Moreover, the ratio between machine cost and production rate is high, as for high productions this type of machines must be structured with separate processing units.

[0011] Furthermore, the need to depressurize and cool the machine (when it operates pressurized and/or at a temperature) also results in a considerable consumption of energy.

[0012] In order to improve productivity, numerous types of machines have been developed for continuous cycle processing of fabrics in rope form or of open width fabrics. These machines substantially have a transfer path with treatment sections or tanks which generally allow good treatment on the surface of the fabric and more efficient and strong mechanical treatments to be obtained without the need for frequent stops; this therefore increases the productivity and decreases labor costs.

[0013] Some of these machines are described for example in the documents US4766743, US5431031, US5311627, US5243840, US5520027, US6148648 and in EP1425454, EP0808930, EP1781854.

[0014] This latter type of machines are effectively used in the processing of fabrics, for which strong processing, and in particular consistent softening, is required.

[0015] These machines are generally complex in construction and use, and transfer of the fabric can be difficult due to the tortuousness of the paths or the limited efficacy of the transfer systems.

[0016] Machines with continuous cycle have been also studied, which provide rotating baskets that process fabrics in rope form. This type of machines generally comprise one or more rotating baskets, in which the fabric is fed into an inlet section, passes through the machine following a transfer path in any intermediate baskets and is extracted gradually from the outlet section at the opposite end of the path, thus without forming a closed path inside the machine - see for example the patents US4010550, FR2345548, EP0495761, EP0633340, IT1308505 and EP1415031.

[0017] In this way it is possible to increase productivity and to decrease labor costs, without the need for the machine to be frequently stopped.

[0018] A drawback of this type of machines with baskets is the tendency to form knots or constrictions in the

fabric, due to the presence of great lengths in each basket. The knots that form in the stock of fabric contained inside a basket compromise the final result of processing, as radially extending striations form in the piece of treated fabric. Rotation of the basket or baskets, although according to alternating directions, causes torsions in the piece of fabric, which generate creases and so-called accordion striations in the treated piece.

Summary of the invention

[0019] According to one aspect, the present invention provides for a machine for treating fabric in rope form which overcomes or alleviates one or more of the aforesaid drawbacks of existing machines, and for a related processing method.

[0020] In particular, an object of one embodiment of the present invention is to provide a machine with at least two consecutive treatment sectors, and a related processing method thereof, which allow more uniform treatments to be obtained on a rope of a fabric, with limited formation of knots and/or torsions.

[0021] An object of another embodiment is to treat a fabric in rope form with a process of the continuous type, thus obtaining a degree and a quality of processing which are generally typical of processes of the discontinuous type.

[0022] Substantially, according to one embodiment of the present invention, a machine is provided for continuous treatment of a fabric in rope form comprising: a plurality of treatment sectors rotating about at least one axis of rotation, arranged in series along a feed path of the fabric; and a respective transfer system of the fabric between consecutive treatment sectors, to transfer the fabric along said feed path from a sector upstream to a sector downstream with respect to the transfer system. The transfer system is designed to reduce torsion induced in the fabric by rotation of the sector upstream with respect to the transfer system.

[0023] In this way torsions or windings of the rope of fabric around itself decrease. By providing several treatment sectors, instead of a single basket or treatment sector, it is possible to treat in an efficient manner a large quantity of fabric, forming stocks of limited length in each treatment sector. In this way the formation of knots, constrictions or windings of the rope during processing decreases.

[0024] The effect of the reduction in torsion can be advantageously obtained by providing that the transfer system rotates, preferably but not necessarily at the same speed as the treatment sector associated therewith, about an axis substantially oriented according to the path of the fabric through the transfer system. This can be achieved by making the transfer system integral with the treatment sector with which it is associated, or also by supporting the transfer system in a unit rotating with a rotation movement controlled by a motorization that is separate from that of the treatment sector, to rotate the

transfer system in a manner coordinated with the rotation movement of the treatment sector.

[0025] In some embodiments the treatment sector can comprise a rotating basket, or a rotating drum, with or without apertures for the passage of a bath of treatment liquid. The treatment sectors can be composed of sections of a same rotating drum separated by dividing walls, in such a way that a limited stock of fabric forms in each section or sector, whilst a large length of fabric is being treated throughout the machine. Division of the fabric into several stocks of limited length and the provision of an intermediate transfer system between each sector or each section allows a substantial decrease in the formation of torsions, loops and/or knots. This configuration is also particularly simple and economical.

[0026] Similar results can be achieved when the sectors are formed of separate rotating baskets, drums or other members or chambers, controlled by a common motorization or also by independent motorizations. A solution of this kind is more complex from a mechanical point of view but it could allow greater flexibility in the management of treatments on the various portions of fabric in the different treatment sectors or spaces.

[0027] In particular, the rope of fabric being processed forms a stock of fabric which opens or loosens partially inside the treatment space or sector, thus facilitating shrinking of both weft and warp of the fabric, as in conventional discontinuous machines with baskets, whilst at the same time obtaining a much more uniform degree of treatment with respect to those discontinuous machines, due to the fact that formation of knots, constriction or torsions of the rope of fabric is greatly reduced.

[0028] Consequently, the final effect of processing on the rope of fabric is more complete, penetrating and uniform, and the quality of the finished product is clearly higher than that of conventional discontinuous processes with baskets.

[0029] Treatment section or sector means any structure able to form at least one treatment volume for containing and processing the fabric, inside which the aforesaid stock of fabric is formed and processed.

[0030] The treatment sectors can be formed by treatment baskets or drums suitably designed and produced in various manners according to particular construction, space and/or processing requirements.

[0031] Furthermore, it is also possible to connect in series several treatment machines or sections independent from one another, to form a (semi) complete finishing line with modular units.

[0032] The transfer system according to the invention comprises advantageously and preferably at least one motorized drawing element (or a pair of elements) to transfer or pull the rope of fabric along the transfer direction, for example a pair of spindles or reels or the like.

[0033] Advantageously, in a possible embodiment at least one drawing motorization to actuate the drawing element or elements is associated with the frame of the machine, i.e. outside the treatment space or sector, and

is mechanically connected to the drawing element(s) through a coupling joint; alternatively, a drawing motorization is associated with each transfer system and rotates therewith, see the description below.

[0034] Advantageously, the transfer system or systems can be motorized in a bidirectional manner, in order to move the fabric alternatively in opposite directions inside the machine, with a speed greater than the speed for inserting and extracting the fabric into/from the machine, so as to allow repeated treatment in each treatment sector.

[0035] A further embodiment provides that the transfer system or systems are placed at such a height as to create an axial tension on the rope of fabric (mainly obtained by the weight of the fabric) during activation thereof to transfer the fabric, so as to extend the rope, thus further facilitating its transfer and loosening of knots and of loops.

[0036] In another particularly advantageous embodiment, the treatment sectors comprise an axis of rotation about which they rotate in order to perform the treatment and a geometrical axis, or axis of symmetry; the axis of rotation being different from the aforesaid geometrical axis, i.e. they are mutually skewed or inclined and incident. A sector-inlet section and a sector-outlet section for the fabric are also provided, advantageously arranged approximately at the level of the axis of rotation of the sectors.

[0037] In this way rotating treatment sections are obtained, inside which the fabric is moved alternatively in opposite directions during treatment, with a beneficial effect on processing.

[0038] It should be noted that this latter embodiment can also be provided with a single treatment sector and/or without transfer systems designed so as to reduce or eliminate torsion in the fabric being treated.

[0039] A further advantage of some embodiments of the machine according to the invention is the fact that it is highly versatile, as it allows different treatments to be performed in each sector with the same machine, providing for distinct and separate pumping and/or circulation systems for each treatment fluid (washing or drying air, finishing liquids or the like).

[0040] By providing bidirectional transfer systems it is possible to obtain a high quality of treatment with a machine of extremely reduced dimensions, providing different sectors for different processes and performing several transfers according to the degree of processing required. In this case, there is a considerable decrease in both production costs and time, as well as energy consumption, while at the same time increasing productivity.

[0041] According to another aspect, the invention relates to a method for the continuous treatment of a fabric in rope form, comprising the following steps:

- a) arranging in series along the transfer path of the fabric, at least two consecutive rotating treatment sectors and one transfer system for the fabric between said consecutive treatment sectors;

b) gradually transferring the fabric along the transfer path through said treatment sectors;

c) rotating said treatment sectors about a first axis of rotation in order to process the fabric;

d) decreasing, through said transfer system, torsions or windings of the fabric in rope form during processing.

[0042] Further advantageous features and embodiments of the method and of the machine according to the invention are indicated in the appended claims and will be further described hereunder with reference to some non-limiting embodiments provided by way of example.

Brief description of the drawings

[0043] The present invention can be better understood and the numerous objects and advantages thereof shall be apparent to those skilled in the art with reference to the accompanying schematic drawings, which show a non-limiting practical example of the invention. In the drawing:

figure 1 shows an axonometric view of a machine in drying configuration in one embodiment of the invention;

figure 2 shows an axonometric view of a machine in washing configuration in another embodiment of the invention;

figure 3 shows a detail of the transfer system used in figures 1 and 2;

figure 4 shows a partially cross sectional side view of another embodiment of the invention in drying configuration;

figure 5 shows a detail of the transfer system of figure 4;

figure 6 shows a partially cross sectional side view of a machine in a further embodiment;

figures 7 and 8 show further embodiments of a machine according to the invention;

figure 9 shows a section according to a longitudinal vertical plane of a further embodiment of a machine according to the invention, with treatment sectors presenting a geometrical axis inclined in relation to the axis of rotation of the sectors; and

figures 10 and 11 show in longitudinal cross section angular positions rotated through 90° and 180° respectively of one of the treatments sectors of figure 9.

Detailed description of some embodiments of the invention

[0044] In the drawings, in which equal or equivalent parts have the same numbers in all the different figures, two configurations of a machine according to the invention are indicated with 1A and 1B, see figures 1 and 2 respectively, and comprise a frame 2 on which three

treatment sectors 3, 5, and 7 of the basket type are mounted, coaxial and rotating - according to the arrow F2 - about a first axis X of rotation to process a fabric T in rope form. These treatment sectors are also arranged in succession along a direction F1 of feed parallel to their axial extension.

[0045] In one embodiment, the treatment sectors 3, 5, and 7 are of a substantially conventional type. They comprise side walls 3P, 5P, and 7P of a substantially cylindrical shape with a plurality of holes for the circulation of air or liquids.

[0046] Advantageously, the machine 1A or 1B comprises an inlet section 5A with an aperture for inserting a rope of fabric T inside a first basket or treatment sector 3, and an opposite outlet section 7A with an aperture for extracting the rope of fabric T from the third and last basket or treatment sector 7.

[0047] The first treatment sector 3 has a substantially vertical wall 3S (on the left in the drawing) and a substantially vertical opposite wall 3D (on the right in the drawing). The second treatment basket or sector 5 has a vertical wall 5S (on the left in the drawing) and an opposite wall 5D (on the right in the drawing) and the last basket 7 has a vertical wall 7S (on the left in the drawing) and a further opposite wall 7D (on the right in the drawing).

[0048] The vertical wall 3S of the first basket 3 is associated with the inlet section 5A of the machine 1A - 1B; the vertical wall 7D of the last basket 7 is associated with the outlet section 7A of the same machine 1A - 1B. The vertical walls between contiguous baskets are adjacent, i.e. the wall 3D of the basket or sector 3 is adjacent to the wall 5S of the basket 5 and forms an intermediate section 6, whilst the wall 5D of the basket or sector 5 is adjacent to the wall 7S of the basket 7 and forms an intermediate section 8.

[0049] On each intermediate section 6 and 8 (formed by the vertical walls 3D, 5S, and respectively 5D, 7S) a through aperture is provided of adequate dimensions to house a respective transfer system 19 suitable to transfer the fabric T from one basket or sector to the adjacent basket or sector. In some embodiments the transfer system 19 is supported internally by a frame 20 fixed to one or other or both walls defining the respective section 6 and 8, as shown in the figure.

[0050] In a modified embodiment, instead of pairs of walls 3D, 5S, and 5D, 7S, between the various treatment sectors a single wall can be provided, on which the respective transfer system 19 is supported. What is relevant is only that a single basket or drum is divided into several treatment sectors, in order to divide, in the single treatment sectors, the stock of fabric T into a plurality of portions or stocks formed by smaller quantities of fabric, in order to limit or reduce the risk of knots forming, with a transfer system from one treatment sector to another, which reduces the formation of torsions in the piece of fabric.

[0051] Advantageously, each transfer system 19 is ar-

ranged spaced with respect to the first rotation axis X and comprises drawing elements formed by two drawing cylinders or rollers 25 and 26 adjacent to each other in such a way that the rope of fabric T passes between them, as described in greater detail below. With this arrangement, when the treatment sectors 3, 5, 7 rotate about the axis X, the transfer systems 19 rotate integrally with the sectors 3, 5, 7 about the same axis.

[0052] In some embodiments, ribs 16 extend inwards from the cylindrical walls 3P, 5P and 7P, to transfer and beat the fabric T being processed.

[0053] The treatment baskets or sectors 3, 5, and 7 rotate integrally according to the arrow F2 clockwise or counter-clockwise or alternatively in one direction and in the other. This rotation is obtained through a rotation mechanism 9 which, in this embodiment, comprises a plurality of rollers 9A integral with a respective rotation shaft 9B on which the cylindrical walls 3P, 5P and 7P rest, and suitable to transmit a rotatory motion from a motor (shown only in figure 1 for the sake of simplicity and indicated with the number 10) to the cylindrical walls 3P, 5P and 7P. In some embodiments, the rollers 9A can be toothed and engaging with crown wheels integral with the drum or cylinder formed by the set of baskets or sectors 3, 5 and 7.

[0054] In order to process a fabric T with the machine 1A - 1B in a first loading step, the rope of fabric T is arranged along the entire path inside the machine, i.e. the fabric T is arranged inside each basket or sector 3, 5 and 7, so as to form a preset quantity of stock (advantageously and preferably of approximately 10 - 20 meters, but also up to 70 meters and more in each treatment basket or sector 3, 5, 7) according mainly to the type of fabric and of processing to be performed. Formation of the stock can also be gradual, i.e. in a first step the fabric is pulled towards the machine in such a way that the head of the piece exits from the section 7A to start the actual treatment step, during which the fabric is gradually fed through the treatment sectors 3, 5, and 7 thus forming an adequate stock of fabric in one sector after the other. In this way each section of fabric is processed for the necessary time inside each treatment sector.

[0055] In the embodiments shown in figures 1 and 2, a feed roller 13 feeds fabric in open width to an inlet reel 15A through an inserting ring 15I suitable to form a rope of fabric T before entering the machine 1A - 1B. The rope of fabric obtained is fed to the machine 1A - 1B through the inlet section 5A by means of an inlet conduit 14A. The rope of fabric T forms a stock inside the first treatment basket or sector 3, and is subsequently transferred gradually to the adjacent treatment basket or sector 5 through a first transfer system 19 positioned on the intermediate section 6. In the basket 5 the rope of fabric forms a further stock which is transferred gradually to the last treatment basket or sector 7 through a second transfer system 19 positioned on the intermediate section 8. From the last basket 7 the rope is extracted by means of an outlet reel 15B through the outlet section 7A and an outlet conduit

14B.

[0056] The reels 15A and 15B are advantageously motorized to facilitate feeding of the fabric T.

[0057] The machine 1A illustrated in figure 1 is in a drying configuration and comprises a drying system which substantially provides a fan 27 suitable to create a current of drying fluid (usually ambient air) and connected through a connecting pipe 31 to a heating battery 29 arranged above the treatment baskets 3, 5 and 7, which serves for heating the treatment fluid. The heated fluid flows subsequently into the treatment baskets or sectors 3, 5, and 7 through the holes in the cylindrical walls, passes through drawer filters 33 positioned below the baskets 3, 5, and 7 and is subsequently sucked up again by the fan 27. On the feed conduit of the fan 7 a branch 35 is provided forming a stack for discharging the air from the circuit described above. A valve or other adjustable system, not shown, allows division of the flow delivered from the fan 27 by discharging a part thereof through the stack 35 and recirculating another part through the conduit 31 towards the heating battery. An outdoor air intake (not shown) is provided on the suction line of the fan 37, to draw in from the environment a part of fresh air to be fed to the heating battery. The quantity of air discharged through the stack 35 can vary to obtain for example faster or slower drying, as the greater the flow of air discharged from the circuit and replaced with ambient air is, the greater the speed of drying will be and vice versa.

[0058] Figure 2 shows the machine 1B similar to the previous one of figure 1, but which differs therefrom in that it is in a washing configuration. In figure 2, equal reference numbers correspond to the same elements of figure 1.

[0059] This machine 1B provides a washing system - instead of a drying system - substantially comprising an insertion vessel 131V for the wash liquid (usually water) that feeds a circulation filter 133 through a connecting pipe 131A. A circulation pump 127 draws the wash liquid from the filter 133 to transfer it to a heat exchanger 129 suitable to heat the liquid and then send it to a series of sprinklers 131S through a pipe 131B. The sprinklers 131S are arranged above the baskets 3, 5, and 7 to spray wash liquid inside them through the treatment holes.

[0060] Figure 3 shows in greater detail an advantageous embodiment of the transfer system 19. It comprises a feed unit with two drawing rollers 25 and 26 mounted on support and rotation shafts 25X and 26X respectively, so that the rope of the fabric T passes through the rollers 25 - 26 to receive therefrom the feed motion. In the illustrated embodiment, both rollers are motorized, but it is also possible to motorize only one roller or to use only a single roller.

[0061] The rollers 25 and 26 shown in figure 3 are shaped, to facilitate passage of the rope of fabric T therebetween. Clearly, it is also possible for the rollers to have any other type or conformation according to the construction or specific processing requirements.

[0062] The supporting shafts 25X and 26X are supported by a pair of bearings 25C and 26C and are preferably and substantially transverse with respect to the direction of transfer F1 of the fabric T and therefore advantageously oriented at an angle of 90° with respect to the first rotation axis X of the treatment baskets or sectors 3-7. In other embodiments different directions from those indicated in the figure can also be provided.

[0063] The bearings 25C and 26C are fastened to the frame 20 integral with the adjacent walls 3D and 5S of the intermediate section 6 between the baskets 3 and 5, or with the adjacent walls 5D, 7S of the intermediate section 8 between the treatment baskets or sectors 5 and 7. The shafts 25X and 26X are spaced by a distance D1 and respectively D2 with respect to the first axis X.

[0064] Advantageously, the drawing rollers 25 and 26 are motorized to rotate about the rotation shafts 25X and 26X respectively (see the arrow F3) transferring the rope of fabric T from one basket or sector to another through a coupling drawing motorization 37 arranged on the frame 2 outside the baskets 3, 5, and 7.

[0065] In some embodiments the drawing motorization 37 comprises a motor M slidable according to the double arrow F4 along translation guides 41A of a structure 41 fixed on the frame 2 of the machine. The motor M is kinematically connected to a shaft 37A through gears, not shown, housed inside a box 37D and suitable to transmit the rotation motion from the motor M to the shaft 37A.

[0066] The shaft 37A can be connected mechanically to one 25X of the support shafts 25X and 26X through a coupling joint 37 formed by a male grooved end 37E of the movable shaft 37A, which can be inserted in a grooved hole 37B of a respective end of the support shaft 25X. A universal joint 37C is provided on the shaft 25X before the hole 37B to facilitate coupling thereof and transmission of the motion.

[0067] A pneumatic actuator 43 is associated with the structure 41 and is connected through a connecting swivel joint 43A to the movable shaft 37A so as to move the shaft 37A (with which the motor M sliding along the guides 41A is integral) away from or towards - according to the arrow F4 - the support shaft 25X to insert or extract the coupling joint 37.

[0068] Therefore, the configuration described above provides the coupling between the drawing motorization 37 and the transfer system 19, stopping rotation F2 of the baskets 3, 5, and 7 in a preset coupling point, in which the support shaft 25X is coaxial with the movable shaft 37A.

[0069] Advantageously, the aforesaid coupling point between the transfer motorization 37 and the transfer system 19 is provided at the maximum height with respect to the axis X of rotation, so as to exert a further traction on the rope of fabric T due to its weight to further facilitate extension, loosening and movement of the rope of fabric T.

[0070] When coupling has been performed, the motor M imparts a rotation to the movable shaft 37A, which

transmits it to the support shaft 25X through the coupling joint 37; the support shaft 25X transmits rotation to the support shaft 26X through a gear drive comprising a gear wheel 39A on the support shaft 25X engaging with a respective gear wheel 39B on the support shaft 26X. The support shafts 25X and 26X transmit the drawing rotation F3 to the rollers 25 and 26 respectively to transfer the fabric T.

[0071] Clearly, the aforesaid coupling drawing motorization 37 is described merely by way of example, as it can be of any other type suitable for the purpose. For example, it is also possible to use one drawing roller or two drawing rollers motorized through an internal motor, for example coaxial with the respective roller. In this case, in the coupling position a simple electrical connection is provided, which, when the drum (inside which the treatment sectors 3, 5, and 7 are formed) stops in the desired position, is connected to the internal motors of the rollers to cause rotation thereof. Furthermore, it is also possible to provide for a different coupling position, according to particular construction or processing needs. For example, instead of electrical motors, hydraulic motors can be used.

[0072] Also the rollers 25, 26 can present a different form with respect to the form illustrated, or they can be replaced with other drawing or transfer systems, for example reels with an adequate shape.

[0073] An embodiment similar to the previous one and not illustrated for the sake of brevity provides that said transfer system 19 (comprising the rollers 25/26 or other drawing devices suitable for the purpose) is associated in axial position on at least one of the sections 6 or 8, i.e. on one of the pairs of vertical walls 3D, 5S and/or 5D, 7S, in such a way that the axis X of rotation, about which the transfer systems 19 and the treatment sectors 3, 5, 7 rotate, crosses in an approximately median position the nip between the rollers 25, 26.

[0074] Advantageously, in some embodiments the transfer system 19 comprises guiding elements 25G, for example crescent shaped fabric-detaching blades, suitable to accompany the rope of fabric T and facilitate entry/exit thereof during transfer.

[0075] It is clear that the aforesaid treatment sectors 3 - 7 are not whatsoever limited to the number and type described, representing an example of embodiment for a machine according to the invention.

[0076] Figure 4 shows a machine 100A in drying configuration according to another embodiment of the present invention.

[0077] This machine 100A substantially comprises a frame 102 with which three treatment sectors 30, 50 and 70 respectively of the basket type are associated, coaxial and rotating about a first axis 100X of rotation - see the arrow F2 - to process a fabric T in rope form and comprising side walls 30P, 50P and 70P respectively with substantially cylindrical shape with a plurality of treatment holes, in a manner similar to the embodiments described above.

[0078] Rotation according to the arrow F2 of the baskets 30, 50, and 70 is controlled by a rotation mechanism schematized in a manner substantially similar to the manner described in figures 1 and 2, and indicated again as a whole by the number 9. It comprises rollers or gear wheels 9A keyed on a shaft 9B made to rotate by a motor 10. On the rollers 9A the treatment baskets or sectors 30, 50, 70 rest. Alternatively, when gear wheels 9A are used, these engage on crown wheels integral with the treatment baskets or sectors 30, 50, 70.

[0079] Analogously to what is described above, an inlet section 105A of the machine 100A is provided, with an aperture for inserting the rope of fabric T inside the machine 100A and an opposite outlet section 107A with an aperture for extracting the rope of fabric T from the machine 100A.

[0080] Furthermore, the first basket 30 has a vertical wall 30S and another opposite wall 30D. The second basket 50 has a vertical wall 50S and another opposite wall 50D and the last basket 70 has a vertical wall 70S and another opposite wall 70D.

[0081] The main difference with respect to the embodiments illustrated in figures 1 and 2 consists in that the baskets 30, 50, and 70 are arranged mutually spaced along the direction of transfer F1 instead of forming portions of a common drum.

[0082] Between the vertical walls of adjacent baskets (i.e. the walls 30D and 50S of the adjacent baskets 30 and 50 and the walls 50D and 70S of the adjacent baskets 50 and 70) intermediate sections 60 and 80 respectively are therefore provided, comprising transfer paths or channels of the fabric indicated with 111 and 112 respectively. In a position inside the channels 111 and 112 a respective transfer system 119 is provided.

[0083] More in particular, in the embodiment illustrated in figure 4, the transfer channel 111 is formed by a first part 111A, suitable to make the fabric T pass from an outlet aperture of the wall 30D of the first basket 30 to the first transfer system 119, and by a second part 111B suitable to make the fabric T pass from the first transfer system 119 to an inlet aperture of the left wall 50S of the second basket 50.

[0084] In the same way, the transfer channel 112 is formed by a first part 112A, suitable to make the fabric T pass from an outlet aperture of the wall 50D of the second basket 50 to the second transfer system 119, and by a second part 112B suitable to make the fabric T pass from the second transfer system 119 to an inlet aperture of the wall 70S of the third basket 70.

[0085] The first and the second wall 111A, 111B and 112A, 112B of the channel 111 and 112 respectively, each presents preferably a curved lower guide surface to facilitate sliding of the fabric inside them.

[0086] In one embodiment of the invention, each transfer system 119 rotates according to the arrow F5 around itself about a second axis 100Y of rotation spaced by a distance D3 with respect to the first axis 100X and substantially parallel thereto.

[0087] Advantageously, in one embodiment a motor 157 is provided, suitable to make the two transfer systems 119 rotate around themselves with an angular velocity which may be advantageously equal to the angular velocity with which the treatment baskets or sectors 30, 50, 70 rotate. Transmission is obtained through a shaft 157C on which pulleys 157P are keyed, which transmit motion by means of belts 157T to a crown wheel 147 (figure 5) in which, through a frame 148 integral with the crown wheel 147, transfer rollers 125, 126 are supported, between which the fabric T is fed. The crown wheel 147 of each transfer device or system 119 is supported rotatable to the fixed structure of the machine for example by means of a frame 150 (figure 5).

[0088] Therefore, the above-described machine is particularly efficient, as it is possible for the rope of fabric T to rotate around itself by means of the transfer systems 119 at the same rotation speed as the baskets 30, 50, and 70. In this way, there is a decrease in the possibility of torsions forming in the stocks of fabric T in the various treatment baskets or sectors 30, 50, and 70 during processing.

[0089] Furthermore, by setting in an adequate manner the distance D3 between the first and the second axis 100X and 100Y it is possible to create an adequate extension tension on the rope of fabric T suitable to further extend and loosen it.

[0090] The axes of rotation of the drawing rollers 125, 126 are preferably and substantially perpendicular to the direction F1 of transfer of the fabric T and therefore advantageously oriented at an angle of 90° with respect to the first rotation axis 100X of the baskets 30-70. Clearly, any other arrangement suitable for this purpose is also possible.

[0091] In one embodiment, the drawing rollers 125 and 126 are of the type with inflatable chamber, so as to grip the rope of fabric T with as little damage as possible. It is clear that this type of cylinders is merely indicative of an embodiment, and may be of any other type, for example of the type described above with reference to figure 3, or they can be replaced with drawing elements of different type, according to specific construction and/or processing requirements.

[0092] It is clear that the external motorization 157 and the configuration of the transfer system 119 with the support frame 147 of circular shape described above are indicative, and they can be designed in any other convenient way, and therefore do not limit the present invention whatsoever.

[0093] The drawing rollers 125 and 126 can be carried in rotation about their respective axes for example by means of internal motors (not shown), powered from the outside. Alternatively, the motors for actuating the rollers 125, 126 can be outside the rollers and carried by the gear wheel 147. In one embodiment, the electrical supply to the motors of the rollers 125, 126 can be obtained by means of a system of sliding contacts, which allows supply during rotation of the frame 147. In this case rotation

according to F5 of the transfer system and rotation of the drawing rollers 125, 126 about the respective axes can occur simultaneously, so that feed of the fabric from one treatment sector 30, 50, 70 to the other can occur during treatment.

[0094] Alternatively, it is also possible to provide a coupling for electrical supply of the rotation motors of the rollers 125, 126 in a fixed angular position of the respective gear wheels 147, analogously to the mechanical connection for rotation of the transfer system of figures 1 and 2.

[0095] Alternatively a motorization can be provided through hydraulic motors of the rollers 125, 126, and this solution can be adopted also in the machine of figures 1 and 2. A collector can feed the hydraulic liquid during rotation of the frame 147.

[0096] In a modified embodiment, not shown, rotation about the axis 100Y of each transfer system 119 can be controlled by an independent motor, instead of providing a single motor, which actuates all the transfer systems 119 through a common shaft. A solution of this type can be adopted for example by providing that the single treatment sectors or baskets 30, 50, 70 are also controlled by independent motors. In this way it is possible for one sector to rotate separately with respect to the other.

[0097] The fabric in rope form is fed to the machine 100A by an inlet reel 115A, which picks it up from a stock 113 to pass through the inlet section 105A via a guide conduit 117A. The rope of fabric T forms a stock inside the first treatment basket 30, and is subsequently transferred gradually to the adjacent treatment basket 70 through the first transfer system 119 inside the transfer channel 111. In the basket 50 the rope of fabric forms a further stock and is transferred gradually to the last basket 70 through the second transfer system 119 inside the transfer channel 112. From the last basket 70 the rope T is extracted by means of an outlet reel 115B through the outlet section 105D and an outlet guide conduit 117B.

[0098] The reels 115A and 115B are advantageously motorized to facilitate feeding of the fabric.

[0099] In one advantageous embodiment, upstream of the reel 115B an unwinder is provided, comprising a transfer conduit 118 inside which the rope T exiting from the machine 100A passes. The transfer conduit 118 of the unwinder can be carried in rotation about its own axis according to the arrow F6 by means of a further rotation motorization, schematized with 181. Unwinding devices of this type are known and require no detailed description here. Rotation of the conduit 118 by means of the motorization 181 is controlled when a specific sensor detects the presence of torsions in the fabric. Rotation of the conduit 118 and the inner configuration of the conduit are such that they tend to eliminate these torsions from the piece of fabric in rope form, which passes through the conduit 118. The unwinder is part of a rope opener or is arranged upstream of a rope opener, not shown and also known.

[0100] The machine 100A in the configuration de-

scribed in figure 4 further comprises a drying system in which a fan 127 creates a current of drying fluid (usually ambient air) and connected in series through a connecting pipe 131 to a plurality of heating batteries 129 for heating the treatment fluid, each battery being arranged above a respective basket 30, 50, and 70. The fluid is fed to the treatment baskets or sectors 30, 50, and 70 through holes produced in the cylindrical walls 30P, 50P and 70P whilst they rotate, is discharged in a drawer filter 133 arranged below the baskets 30, 50, and 70, and exits from a stack for discharging exhaust fumes 135.

[0101] In figure 4 a transfer system 119 is schematically shown, arranged between the baskets 30 and 50, and another transfer system 119 between the baskets 50 and 70, i.e. inside the transfer channel 111 and 112 respectively; it is also possible to provide this system 119 in a different number and position, for example also at the inlet and/or outlet of the machine.

[0102] Figure 6 shows an embodiment similar to that of figure 4, in which to equal reference numbers correspond similar elements, comprising a transfer system 219 between the baskets 30 and 50, and another transfer system 219 between the baskets 50 and 70. This latter embodiment is different from that of figure 4 substantially in that each transfer system 219 comprises a drawing element of the reel type 192 (instead of the drawing cylinders 25, 26 or 125, 126), which rotates to transfer the fabric T, but is fixed with respect to the frame of the machine.

[0103] The transfer system 219 further comprises a transfer conduit 128 inside which the rope of fabric T passes to connect a treatment basket with the drawing reel 192.

[0104] Advantageously, the further transfer conduit 128 is formed by a pipe inclined and incident with respect to the first axis 100X of rotation of the treatment baskets or sectors and presents a second axis 200Y of rotation. This conduit 128 is made to rotate about the axis 200Y by an external motorization 257.

[0105] In one embodiment, the second external motorization 257 comprises a motor 257M and a transmission element 257T of the belt type or the like. It is clear that this embodiment of the drawing motorization 257 is merely provided by way of example, and it can be embodied in any other suitable manner. The transfer conduit 128 is designed in a manner similar to the conduit of an unwinder which, rotating in a manner coordinated with rotation of the treatment sector upstream, eliminates or reduces any residual torsion in the fabric in rope form T which is transferred through the conduit 128.

[0106] In a modified embodiment, the transfer conduit 128 can be combined with systems for detecting torsion, known and not described in detail here, which detect the presence of any torsions in the fabric and control rotation of the conduit 128 when this is necessary to eliminate any torsion in the fabric. In this case a motor is associated with each conduit 128 and is controlled only when a residual torsion is detected in the fabric in rope form that

passes through the conduit.

[0107] Figures 7 and 8 show in a very schematic manner further configurations of a machine according to the invention with different arrangements and numbers of treatment baskets or sectors.

[0108] In particular, figure 7 shows a machine 200 which comprises a first series of three treatment baskets 230I, 250I and 270I mutually coaxial and adjacent to one another along a direction F10 of transfer orthogonal to their longitudinal extension and a second series of three baskets 230II, 250II and 270II mutually coaxial and adjacent to one another along a direction F11 of transfer orthogonal to their longitudinal extension and parallel to the direction F10 of transfer.

[0109] The first and the second series of baskets are horizontally adjacent and connected through an adequate diverting path 200D of the fabric T.

[0110] Transfer systems 319 according to the invention are arranged between the various baskets 230I, 250I, 270I and 230II, 250II, 270II and along the diverting path 200D.

[0111] Figure 8 shows a machine 300 which comprises a first series of three treatment baskets 330I, 350I and 370I mutually coaxial and adjacent to one another along a direction F12 of transfer orthogonal to their longitudinal extension and a second series of three baskets 330II, 350II and 370II mutually coaxial and adjacent to one another along a direction F13 of transfer orthogonal to their longitudinal extension and parallel to the direction F12 of transfer.

[0112] The first and the second series of baskets are vertically adjacent, i.e. one below the other, and connected through an adequate diverting path 300D of the fabric T.

[0113] Transfer systems 419 according to the invention are arranged between the various baskets 330I, 350I, 370I and 330II, 350II, 370II and along the diverting path 300D.

[0114] It should be noted that the aforesaid transfer systems 319 and 419 of figures 7 and 8 are represented in a very schematic manner with drawing rollers associated with the vertical walls dividing each treatment basket or sector. It is clear that this representation is only provided by way of example, as the configurations described with reference to the previous embodiments or combinations thereof or equivalent systems can be adopted.

[0115] Rotation of the baskets 230I, 250I, 270I and 230II, 250II, 270II of figure 7 and of the baskets 330I, 350I, 370I and 330II, 350II, 370II of figure 8 is obtained through a rotation mechanism schematized in a manner substantially similar to that indicated at 9 in figures 1, 2, 4 and 6; it is also possible for this rotation mechanism to be of any other type suitable for the purpose, in particular according to the conformation of the outer surface of the baskets.

[0116] Figure 9 shows a machine 400, which comprises three treatment baskets or sectors 430, 450 and 470 mutually aligned along the direction F1 of feed and be-

tween which transfer systems 519 according to the invention are arranged.

[0117] Advantageously, each treatment basket 430, 450, and 470 rotates about a common axis 200X of rotation extending along the direction F1 of feed of the fabric, in order to perform treatment on the fabric. Furthermore, each treatment basket or sector 430, 450, 470 is shaped so that its inner cylindrical surface S for containing the fabric has a geometrical or symmetry axis Z inclined with respect to the axis 200X of rotation. Preferably, the two axes Z and 200X are incident, i.e. they intersect, but it is also possible that these two axes are slightly skewed, i.e. they do not lie on the same plane.

[0118] In the embodiment shown in figure 9, the substantially cylindrical inner surface S is obtained through a cylindrical wall 495 presenting a plurality of holes and fixed (for example through welds) at its flanged ends 480, 490 comprising cylindrical walls 480C and 490C coaxial with the axis 200X of rotation of the treatment sectors 430, 450, 470. The cylindrical walls 480C, 490C rest on wheels or rollers 9A keyed on shafts 9B of a system to transmit the rotation motion to the treatment baskets or sectors 430, 450, 470. Number 10 indicates again an actuating motor for actuating the shaft 9B. The rollers or wheels 9A can be replaced with gear wheels engaging with crown wheels obtained on or integral with the cylindrical walls 480C, 490C.

[0119] In this way it is possible to carry in rotation about the axis 200X the cylindrical bodies defined by the walls 495, with a rotation motion which, contrary to the case of conventional machines, does not occur about the geometrical axis of the treatment basket (axis Z).

[0120] It is clear that this embodiment is merely provided by way of example, and it can be obtained in any other manner suitable for the purpose. For example, the walls 495 forming the treatment sectors or baskets 430, 450, 470 can be positioned inside cylindrical bodies with geometrical axes coinciding with the axis 200X, instead of being simply provided with end flanges 480, 490. In this case the outer cylindrical bodies are preferably perforated in order to allow circulation of air or treatment liquids.

[0121] Each basket 430, 450, 470 presents an inlet aperture I and an outlet aperture O for the fabric. Preferably, these apertures I and O are arranged approximately coaxial and approximately at the level of the axis 200X of rotation.

[0122] Also in this latter configuration, between adjacent treatment baskets or sectors 430, 450, 490 transfer systems 519 are provided, equivalent to the systems 19, 119, 219 or 319 and represented in a very schematic manner merely by way of example. They can be advantageously realized according to one of the configurations describe above, or combinations thereof.

[0123] The particular conformation of the treatment baskets or sectors 430, 450, 470 illustrated in figure 9 and described above can be advantageously used also in machines with a single basket, or in machines with

multiple baskets, without intermediate transfer systems between adjacent treatment baskets or sectors.

[0124] The main advantage of the treatment basket or sector configured as illustrated in figure 9 consists in that by rotating the basket about the axis 200X inclined with respect to the geometrical axis Z, the stock of fabric which is inside it is subjected, due to the effect of gravity and of rotation, to a forward and backward movement according to the arrow Ff. In fact, starting from the arrangement of figure 9, where the fabric is all collected in the lowest point of each basket 430, 450, 470 which is the point farthest to the right in the drawing, after a rotation of 180° about the axis 200X the fabric is moved from right to left, as the lowest point of each treatment basket or sector 430, 450, 470 will be, at this point, at the extreme left of each sector. Continuing rotation, the stock of fabric is impacted forwards and backwards due to the effect of this change in the level of the inner surface of the basket, also being subjected to a mechanical effect due to the component of motion of the basket in circumferential direction about the axis 200X.

[0125] The movement of the fabric caused by the reciprocal inclination between the axes Z and 200X can be better understood from the sequence of figures 9, 10 and 11, where figure 10 shows one of the treatment baskets or sectors of figure 9 after a 90° rotation and figure 11 shows the same sector rotated by further 90° and therefore by a total angle equal to 180° with respect to the position of figure 9. The stock of fabric T contained inside the represented treatment sector is moved from right to left during this rotation. Continuing rotation in the same direction or also in alternating directions of the treatment sector, a forward and backward movement of the fabric is obtained between the head walls of the treatment sector, in addition to the normal movement due to rotation.

[0126] The cylindrical walls 495 can be provided with ribs or other elements radially projecting towards the inside of the basket and shaped in an adequate manner to obtain a mechanical action on the fabric being treated.

[0127] It is clear that, as described above, it is possible to perform with the same machine 1A, 1B, 100A, 100B, 200, 300 or 400 different treatments in each of the respective baskets 3, 5, 7; 30, 50, 70; 230I, 250I, 270I, 230II, 250II, 270II; 330I, 350I, 370I, 330II, 350II, 370II; 430, 450, 470 by providing different and separate pumping systems for each treatment fluid (washing or drying air, finishing liquids or the like).

[0128] Therefore, it is also possible to construct a dry and/or wet (semi) complete and automatic finishing line in a manner which can be easily modulated and simply controlled, by providing adequate units at the inlet/outlet of the aforesaid machine 1A, 1B, 100A, 100B, 200, 300 or 400, for example an unwinder of a large roll of fabric or an external machine to create the rope, a padding mangle for textile impregnation, possible pre-drying cylinders to increase drying productivity, a continuous rope opener and a winder at the outlet of the machine.

[0129] In another embodiment of the invention, the cy-

lindrical walls 3P, 5P, 7P; 30P, 50P, 70S of the baskets can be formed by a single elongated cylindrical wall divided by adequate intermediate sections fixed on the frame of the machine or integral with the elongated cylindrical wall.

[0130] Advantageously, at least some of the vertical walls 3S, 3D; 5S, 5D; 7S, 7D and 30S, 30D; 50S, 50D; 70S, 70D can be fixed with respect to the respective baskets, as described in the previous embodiments, or they can be fixed with respect to the frame of the machine.

[0131] According to an advantageous embodiment of the invention, the transfer systems 19, 119, 219, 319, 419 or 519 for transferring the rope of fabric T from one treatment basket or sector to another can be actuated simultaneously to the treatment rotation F2 of the treatment baskets, if the constructional features of the machine allow this. In this way processing of the fabric T is extremely fast and efficient.

[0132] Alternatively, the transfer systems 19, 119, 219, 319, 419 or 519 can be actuated subsequently to the treatment rotation F2 of the treatment baskets, so as not to transfer the fabric from one basket to another during processing.

[0133] In a preferred embodiment of the invention, it is also provided that the aforesaid transfer systems 19, 119, 219, 319, 419 or 519 can transfer the fabric T with an alternating motion in opposite directions at a transfer speed greater than the speed at which the fabric T is inserted in and extracted from the machine 1A, 1B, 100A, 100B, 200, 300 or 400, so as to allow repeated treatment in the single treatment basket.

[0134] In this latter case, a control unit and sensor means are advantageously provided - not shown in the previous figures for the sake of simplicity - in each treatment basket, for example load cells or the like, in order to control independently the stock of fabric which is stored in the respective treatment baskets and to control the system to invert the direction of feed of the fabric in each basket.

[0135] Preferably, the feed speed of the fabric between baskets and the inversion of movement imposed by each transfer system are adjustable irrespective of the speed at which the fabric is inserted in and extracted from the machine 1A, 1B, 100A, 100B, 200, 300 or 400.

[0136] In this way it is possible to feed the fabric at high speed, by passing it repeatedly from one treatment basket to the other and vice versa, before transferring it to the subsequent basket in such a way that each portion of fabric is treated several times in each basket and the passage of the fabric from one basket to the other occurs in a manner which can be controlled irrespective of the feed/delivery speed from the machine.

[0137] Furthermore, compensation or recovery of the effect of "shrinkage" is also advantageously provided for, to prevent a stock of fabric from running out in a treatment basket; for each decrease in the inversion time of each transfer system, a decrease is provided in the feed speed of the fabric from one basket to the adjacent basket.

[0138] In this way it is possible to make the fabric exit continuously from the machine at a perfectly synchronized speed, equal to (or preferably, in view of the effect of shrinkage) lower than the speed at which it enters the machine.

[0139] Control systems for continuous alternate motion of a rope of fabric through several adjacent sections are described in greater detail for example in the patent application WO-A-2007054994.

[0140] Furthermore, the feed movement of the fabric from one basket to an adjacent basket can occur at constant speed or at a speed, which can vary according to specific constructional and/or processing requirements.

[0141] Furthermore, it is possible to provide that two or more of the aforesaid embodiments are combined according to specific constructional and/or processing requirements or according to the type of fabric to be treated.

[0142] For example, it can be provided that the transfer channels 111 and 112 of the transfer system 119 described in figure 4 rotate around themselves, through an external motorization similar to the external motorization 257 of figure 6.

[0143] In a further example the transfer element 118 described with reference to figure 4 can be provided, arranged at the inlet and/or outlet of any one of the aforesaid machines 1A, 1B, 100A, 100B, 200, 300 or 400, or in proximity of at least some of the transfer systems 19, 119, 219, 319, 419 or 519 described above to further facilitate rotation of the fabric T in rope form about itself.

[0144] It is understood that what is illustrated purely represents possible non-limiting embodiments of the invention, which may vary in forms and arrangements without departing from the scope of the concept on which the invention is based. Any reference numerals in the appended claims are provided purely to facilitate reading thereof in the light of the preceding description and of the accompanying drawings, and do not in any way limit the scope of protection.

Claims

1. A machine for continuous treatment of fabrics in rope form comprising: a plurality of treatment sectors rotating about at least a first axis of rotation, arranged in series along a feed path of the fabric; and a respective transfer system of the fabric between consecutive treatment sectors, to transfer said fabric along said feed path from a sector upstream to a sector downstream with respect to the transfer system; **characterized in that** said at least one transfer system is designed to reduce the torsion induced in the fabric by rotation of the sector upstream with respect to the transfer system.
2. Machine as claimed in claim 1, **characterized in that** said transfer system rotates about a second axis of rotation, oriented approximately in the direction of

- feed of the fabric through said transfer system.
3. Machine as claimed in claim 2, **characterized in that** said second axis of rotation is approximately parallel to said first axis of rotation of the respective treatment sector upstream. 5
 4. Machine as claimed in claims 2 or 3, **characterized in that** said second axis of rotation coincides with the first axis of rotation, about which the treatment sector upstream of said transfer system rotates. 10
 5. Machine as claimed in one or more of the preceding claims, **characterized in that** said treatment sectors comprise a substantially cylindrical rotating wall with opposite fabric inlet and outlet. 15
 6. Machine as claimed in one or more of the preceding claims, **characterized in that** said transfer system comprises a feed unit of the fabric, with at least one motorized drawing element for picking-up and transferring the fabric, said feed unit being provided with a rotation motion coordinated with the rotation motion of the respective treatment sector upstream, to reduce or eliminate torsions induced in the fabric by rotation of said respective treatment sector. 20 25
 7. Machine as claimed in claim 8, **characterized in that** said feed unit comprises a pair of drawing elements, at least one of which is motorized, for picking-up and transferring the fabric, arranged with respective axes of rotation substantially orthogonal to the direction of feed of the fabric through said feed unit, said pair of drawing rollers rotating about an axis oriented at approximately 90° with respect to the axes of rotation of the transfer rollers. 30 35
 8. Machine as claimed in claim 6 or 7, **characterized in that** said drawing element or elements are composed of rollers or reels. 40
 9. Machine as claimed in one or more of the preceding claims, **characterized in that** said transfer system rotates integrally with the respective treatment sector upstream. 45
 10. Machine as claimed in one or more of claims claim 1 to 8, **characterized in that** said transfer system is supported independently of said consecutive treatment sectors and is provided with an own motorization, which controls rotation thereof about an axis substantially orthogonal to the direction of feed of the fabric through said transfer system. 50
 11. Machine as claimed in claim 10, **characterized in that** between consecutive treatment sectors a fabric-feed conduit is arranged, the respective transfer system being arranged in said feed conduit. 55
 12. Machine as claimed in one or more of the preceding claims, **characterized in that** it comprises a rotating drum divided by a plurality of intermediate dividing walls into a plurality of treatment sectors.
 13. Machine as claimed in claim 12, **characterized in that** said transfer systems are carried by said intermediate dividing walls and rotate integrally with the drum.
 14. Machine as claimed in one or more of claims 1 to 11, **characterized in that** said treatment sectors each comprise a rotating drum in which a stock of fabric is formed and through which said fabric is fed.
 15. Machine as claimed in one or more of the preceding claims, **characterized in that** the movement of each transfer system and the respective treatment sector upstream are controlled in such a way that whilst the treatment sector rotates about said first axis, the transfer system rotates about a respective second axis, without feeding the fabric through the transfer system, and **in that** during a step in which rotation of the treatment sector is stopped the transfer system is actuated to extract the fabric from said treatment sector.
 16. Machine as claimed in one or more of the preceding claims, **characterized in that** said transfer systems each comprise an axis of rotation about which they rotate to treat the fabric and a geometrical axis or axis of symmetry; said axis of rotation being inclined with respect to said geometrical axis.
 17. A method for continuous treatment of a fabric in rope form, comprising the following steps:
 - a. arranging in series along a transfer path of the fabric, at least two consecutive rotating treatment sectors and one transfer system for the fabric between said consecutive treatment sectors;
 - b. transferring gradually the fabric along the transfer path through said treatment sectors;
 - c. rotating said treatment sectors about a first axis of rotation to process the fabric;
 - d. decreasing, through said transfer system, torsions or windings of the fabric in rope form during processing.
 18. Method as claimed in claim 17, **characterized by** rotating said transfer system in a manner coordinated with rotation of the treatment sector upstream, about a second axis extending approximately according to the feed path of the fabric through said transfer system.
 19. Method as claimed in claim 17 or 18, **characterized**

in that the step (b) of transferring the fabric and the step (c) of rotating said treatment sector are simultaneous or subsequent to one another.

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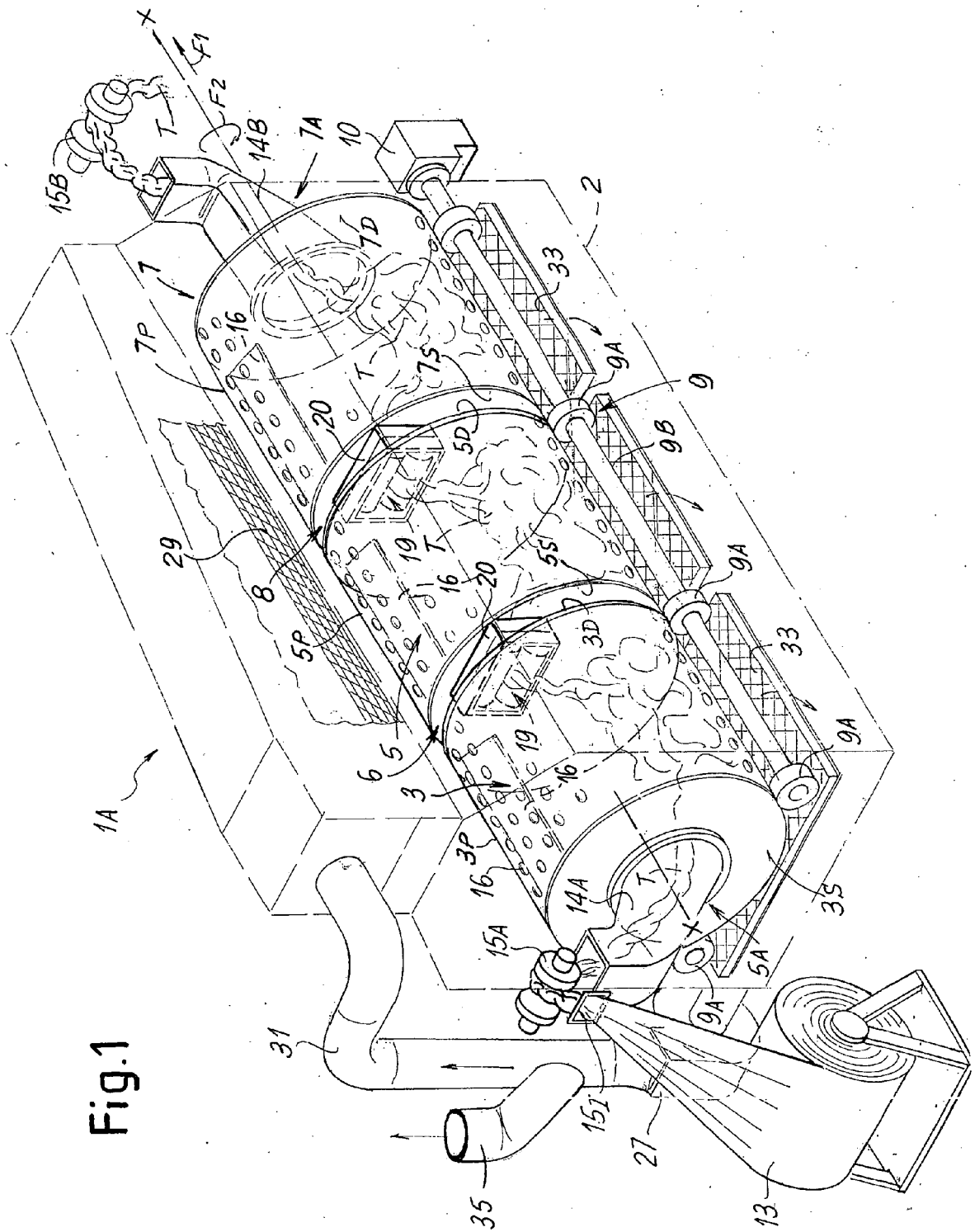
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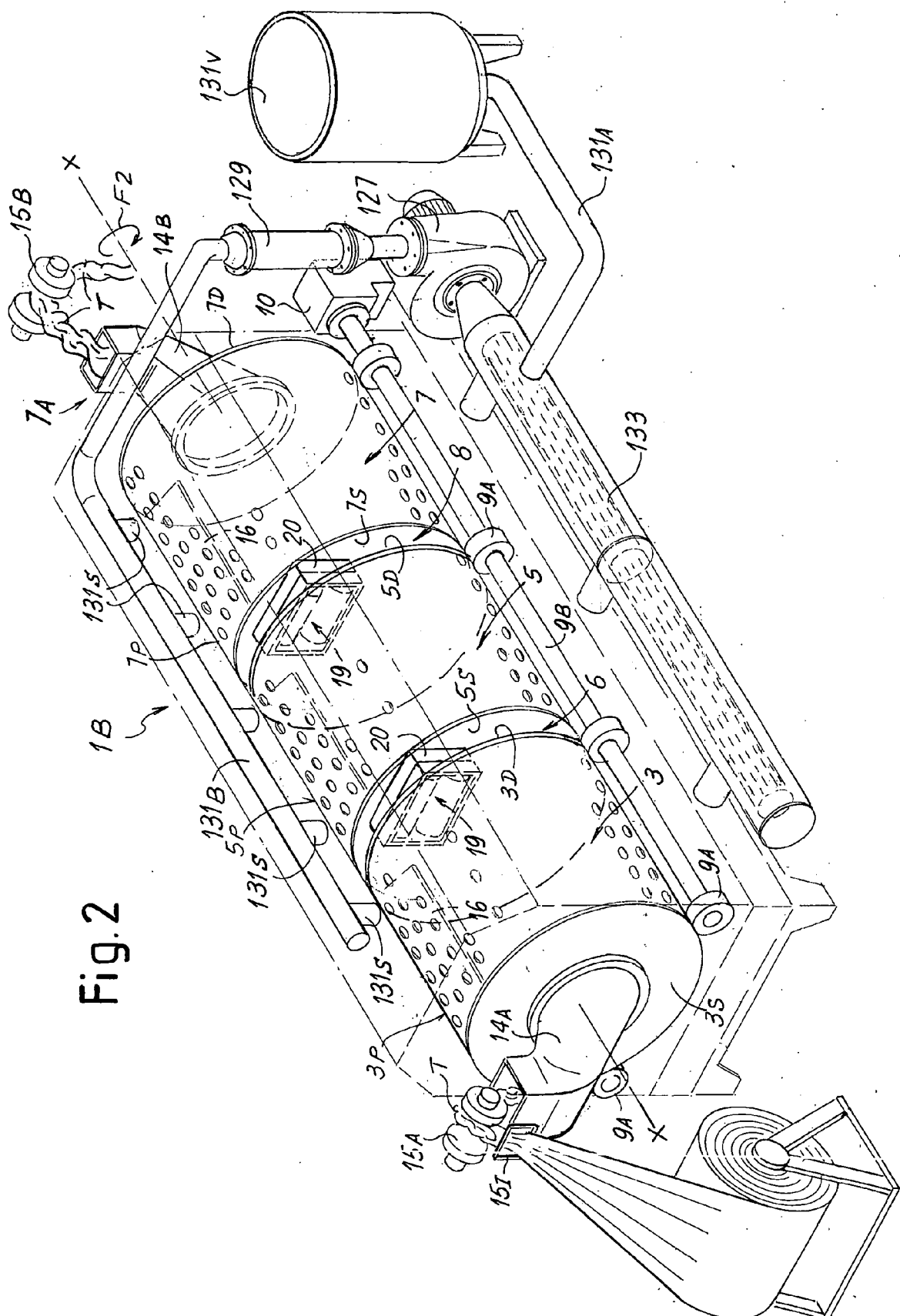
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Fig.1





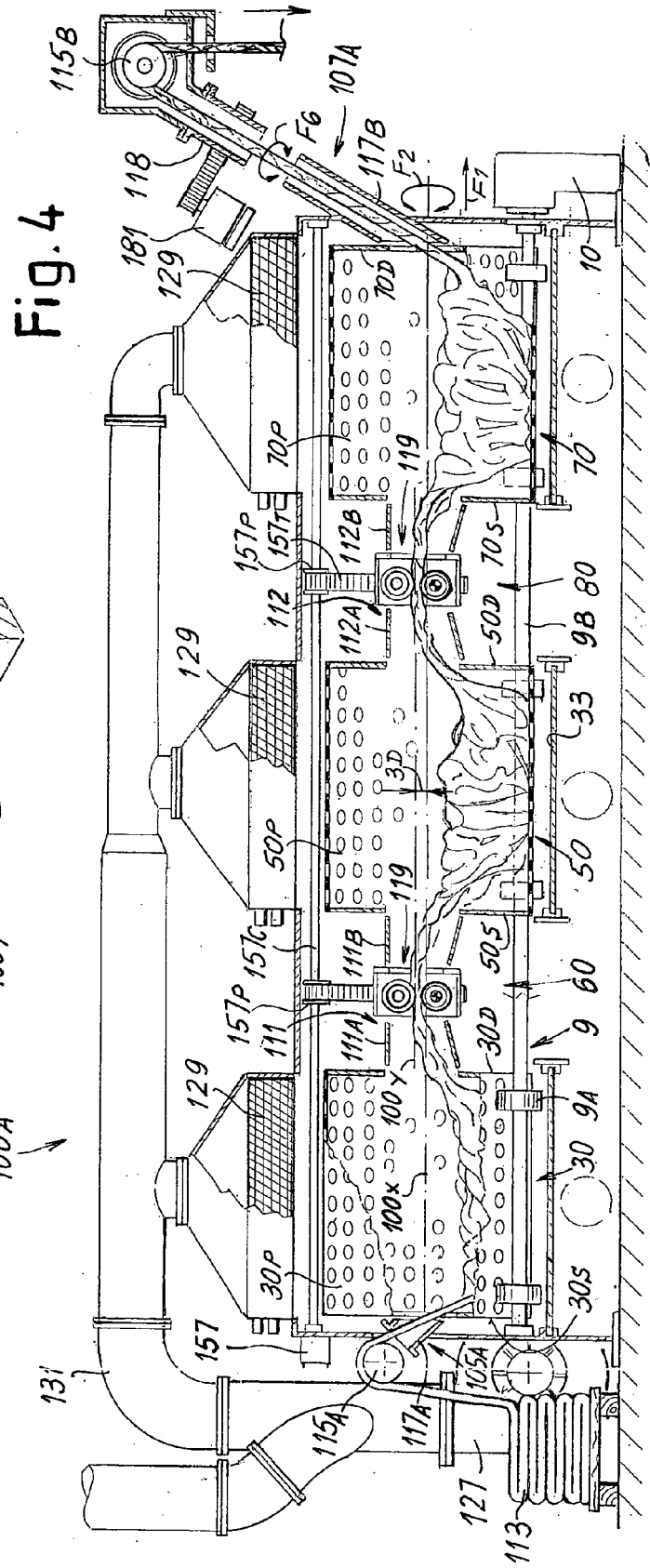
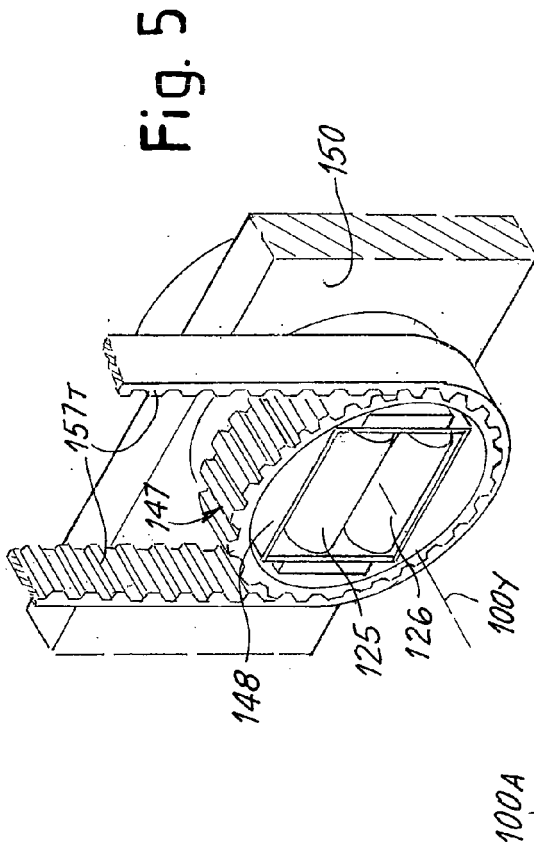


Fig.6

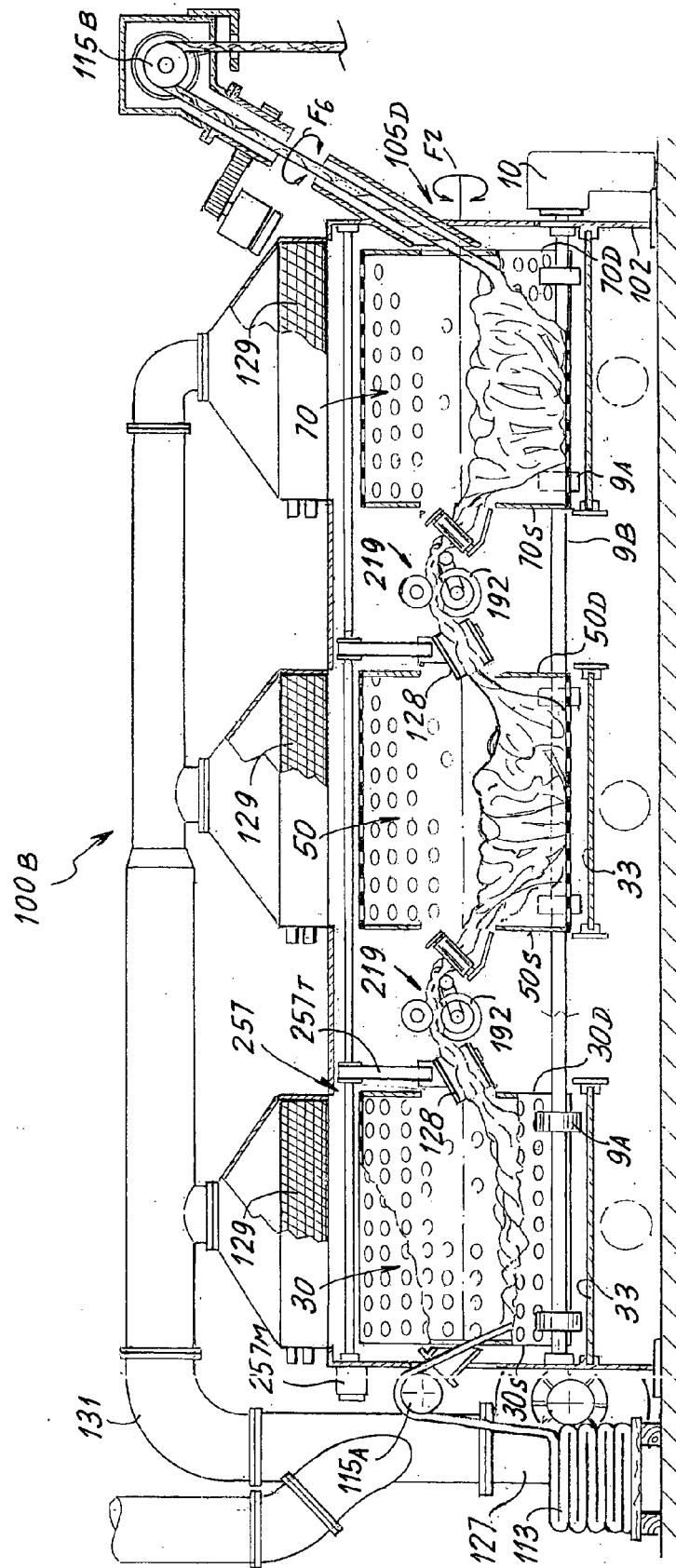


Fig. 7

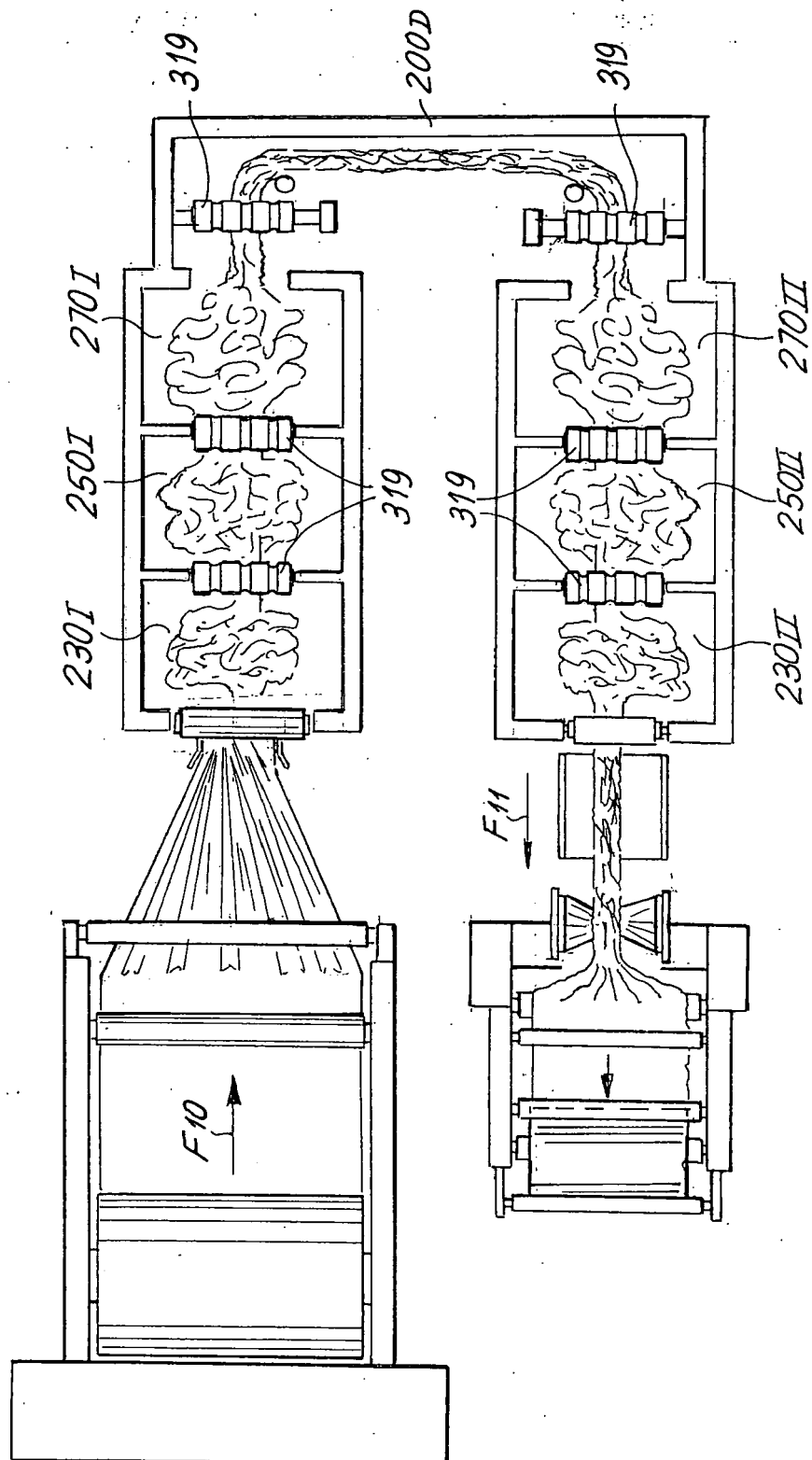


Fig. 8

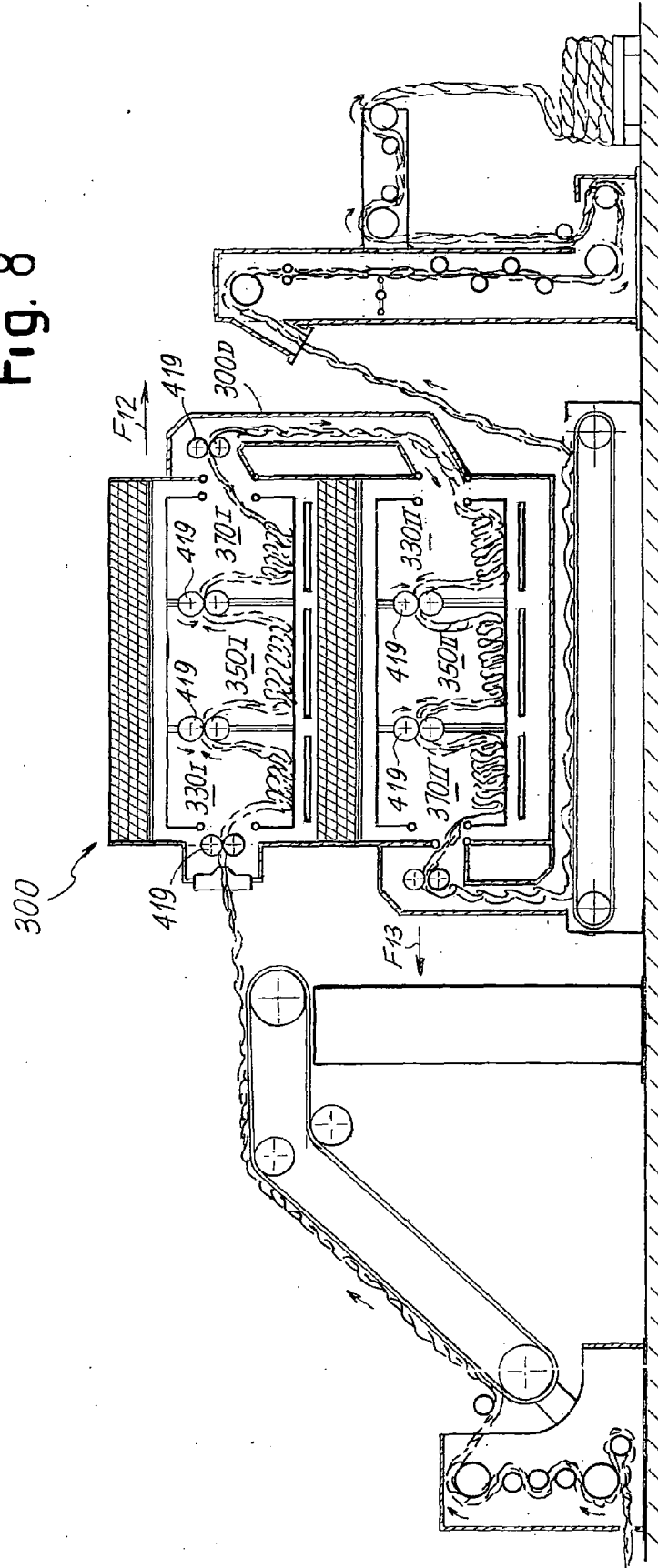


Fig. 9

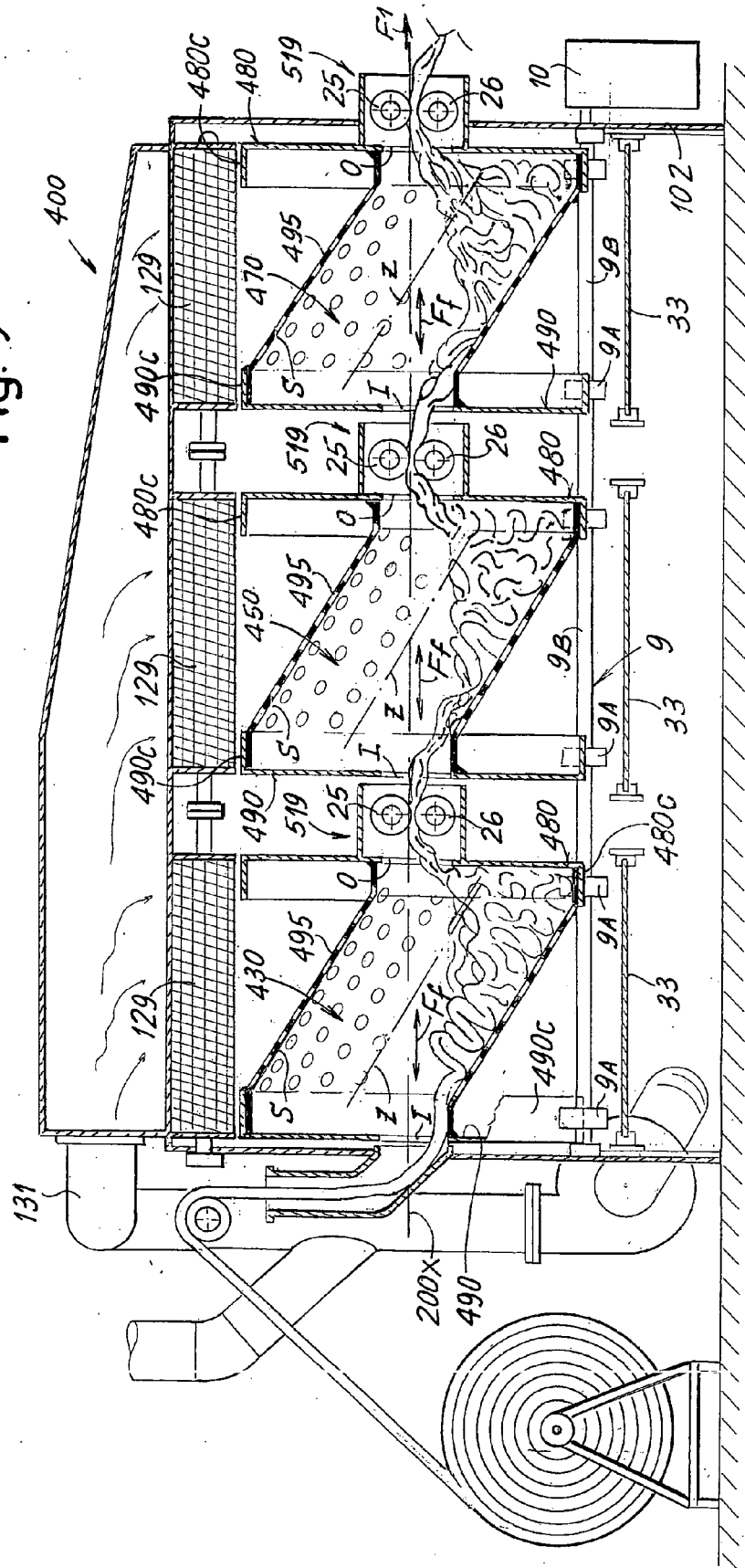


Fig.11

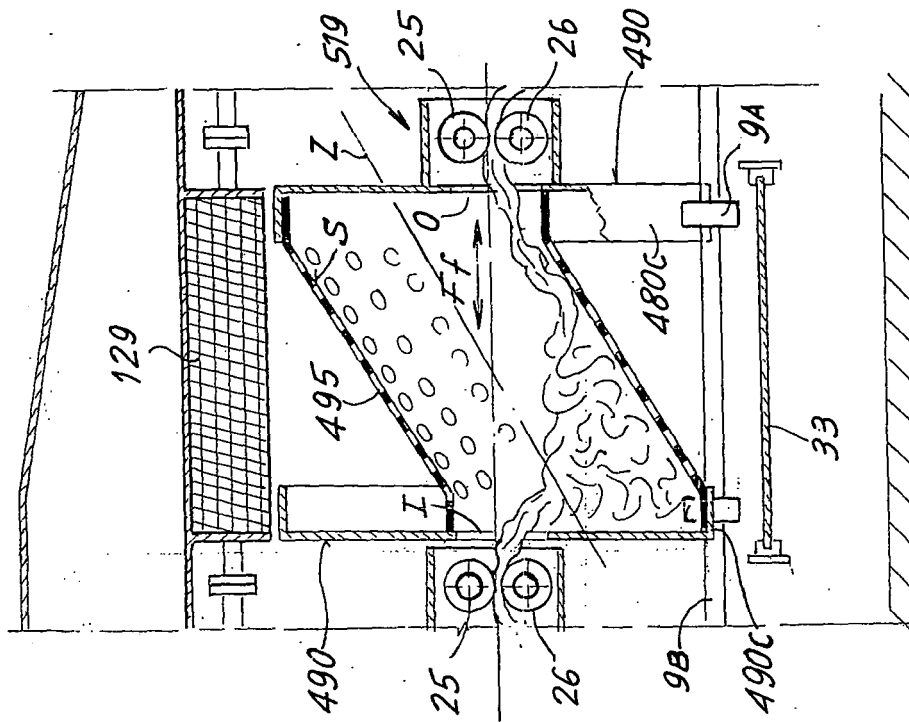
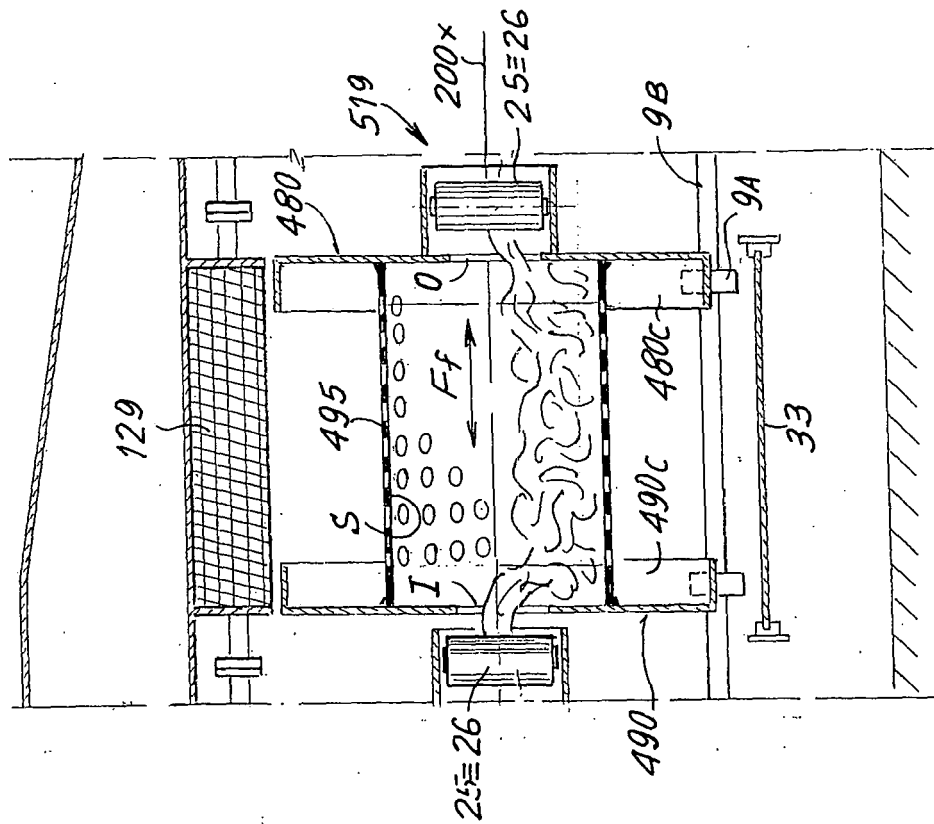


Fig.10





EUROPEAN SEARCH REPORT

Application Number
EP 08 42 5579

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Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
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4	Place of search Munich	Date of completion of the search 19 December 2008	Examiner Bichi, Marco
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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