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(54) Device for moistening a continuous textile material

(57) A device (1) for moistening a continuous textile material (2) comprises a distribution roller (6) capable of rotating, immersed, at least partially, in a prechosen liquid (4) and an application roller (8) capable of rotating, driven by said textile material (2) and adjacent to the distribution roller (6); the distribution roller (6) has a cylindrical wall (7) provided with a spongy and yielding external layer (7a) able to absorb the liquid and the application roller (8) has a substantially non-absorbent cylindrical wall (88) around which the textile material (2) is wound; the wall (88) of the application roller (8) supporting the textile material (2) is able to engage with and compress a prechosen first portion (77) of the external layer (7a) of the distribution roller (6) so as to impregnate the textile material (2) with the liquid (4) and thus moisten it.

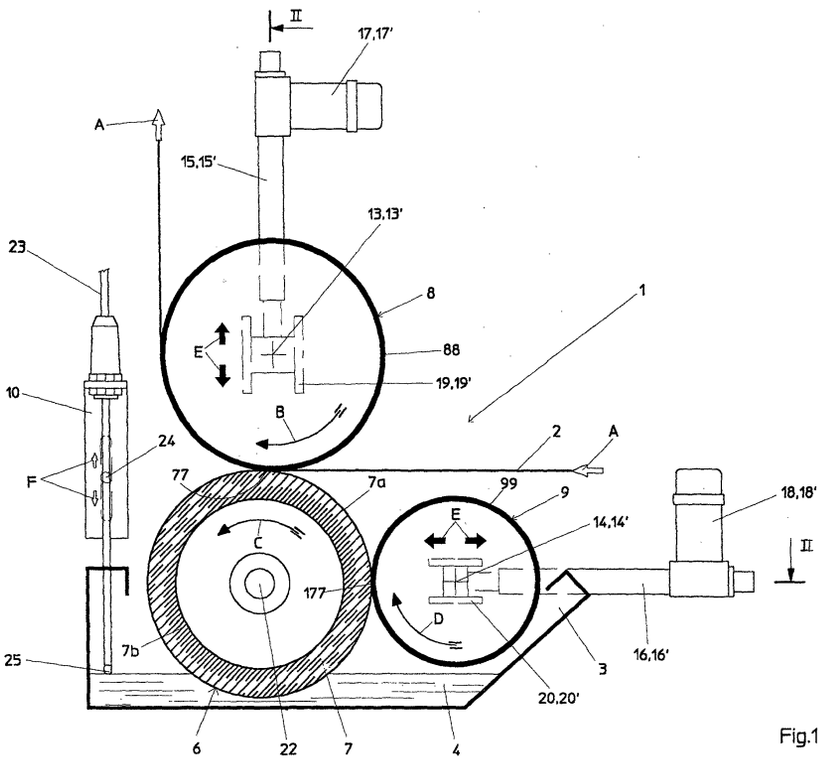

Fig.1

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Description

[0001] The present invention relates to a device for moistening a continuous textile material.

[0002] In the textile industry different methods for treating textile materials are used. One of them consists in moistening using water or aqueous solutions.

[0003] Generally, the moistening of continuous textile materials such as, for example, woven fabrics, knitted fabrics, non-woven fabrics, etc. is performed using one of the three following techniques:

- mechanical application of a liquid;
- physical absorption of moisture in the vaporous state;
- extraction of a predetermined quantity of liquid with conversion into the vaporous state.

[0004] The first of these techniques uses mechanical means able to spray the liquid in the form of a stream of droplets and transfer it onto the surface of the textile material to be moistened. The size of the droplets, their distribution in the stream and their speed of transfer depend essentially on their form and the mode of operation of the spraying means.

[0005] Italian patent application No. M193A001126 describes a moistening apparatus comprising a rotating roller and a cylindrical brush, rotating parallel to said roller and in contact therewith. The roller is partially immersed in a tank containing the liquid to be applied to a textile material which travels at a certain distance from the roller. The roller removes the liquid from the tank and the cylindrical brush collects it from the surface of the roller and projects it, forming a stream of droplets directed towards the textile material.

[0006] In order to moisten the textile material simultaneously on both sides, it is envisaged using two apparatuses.

[0007] In this apparatus, the regulation of the quantity of liquid removed and sprayed depends on the variation in the portion of the roller immersed in the liquid and the speeds of rotation of the roller and the brush.

[0008] It consists of a fairly approximate regulating system which does not allow the quantity of liquid which strikes the fabric to be precisely determined.

[0009] In fact, the dimensions of the droplets and the distribution and the direction of the stream of droplets have a wide range of variation since they depend on many factors such as, for example, the configuration of the brush, the orientation of the bristles of the brush and the manner in which the bristles pick up the liquid from the roller and project it within the stream of droplets.

[0010] The first negative consequence is that the textile material is struck in an irregular manner by the stream of droplets and the moistening action is not uniform. The second negative consequence, which is linked mainly to the relatively large size of the droplets thus produced, relates to the lack of penetration of the liquid inside the structure of the textile material. In fact, the larger the droplets, the more they will tend to accumulate on the surface of the textile material and form rivulets. Thus the liquid remains on the surface of the textile material without being absorbed by the latter and the textile material is partly wetted but not moistened.

[0011] Therefore, this apparatus is unable to ensure precision, repeatability and efficiency of the moistening operation.

[0012] EP-0,723,609-B1 describes an apparatus for the conditioning of continuous textile materials which constitutes an application of the second moistening technique described further above. The apparatus uses, as treatment means, moisture in the vapour state conveyed by an air flow. The apparatus comprises a fan able to produce an air flow through a textile material and moistening means for moistening at least a part of the air flow. The moistening means comprise a series of nozzles which spray jets of water towards a saturator.

[0013] The conditioning process comprises a first stage involving transfer of the moisture from the air flow to the surface of the textile material and from the latter into the textile structure (moistening) and a second stage involving absorption of the moisture by the fibres (actual conditioning).

[0014] This apparatus has a structure and a mode of operation which are very complex and which result in the apparatus being particularly costly and therefore disadvantageous from an economic point of view.

[0015] An application of the third moistening technique described further above consists in a known apparatus which operates by extracting moisture from a wet textile material until a predetermined quantity is left therein. This extraction of moisture is performed using energy supplied by a radiofrequency generator and is therefore, basically, a process of controlled evaporation of the liquid from the wet textile material.

[0016] The apparatus makes use of the properties of radiofrequencies in order to cause evaporation of the moisture from the innermost zones of the textile material and interrupts this action when the desired level of residual moisture is reached.

[0017] This apparatus, in addition to being complex, has a high energy consumption due to the very large amount of power used by the radiofrequency generator.

[0018] The object of the present invention is to provide a device for moistening a continuous textile material which is able to achieve, in a simple and efficient manner, penetration of a predetermined quantity of liquid inside the structure of the textile material.

[0019] The invention relates to a device for moistening a continuous textile material comprising a distribution roller capable of rotating, immersed, at least partially, in a prechosen liquid and an application roller capable of rotating and driven by said textile material, said application roller being adjacent to said distribution roller, characterized in that said distribution roller has a cylindrical wall provided with a spongy and yielding external

layer able to absorb said liquid, and said application roller has a substantially non-absorbent cylindrical wall around which said textile material is wound, said wall of said application roller supporting said textile material being able to engage with and compress a prechosen first portion of said external layer of said distribution roller so as to impregnate said textile material with said liquid and thus moisten it.

[0020] According to one embodiment, said application roller is displaceable with respect to said distribution roller so as to vary the surface area of said first compressed portion of said external layer and thus regulate the moistening rate of said textile material.

[0021] According to another embodiment, said device also comprises a metering roller capable of rotating, adjacent to said distribution roller, said metering roller having a substantially non-absorbent cylindrical wall able to remain in contact with and compress a prechosen second portion of said external layer of said distribution roller in order to extract a part of said liquid from said external layer.

[0022] Preferably, said metering roller is displaceable with respect to said distribution roller so as to vary the surface area of said second compressed portion of said external layer and thus regulate the rate of absorption of said liquid by said external layer.

[0023] Typically, said distribution roller is operationally connected to motor means capable of causing it to rotate.

[0024] Advantageously, said external layer consists of expanded rubber with an absorbent structure.

[0025] Preferably, said expanded rubber is of the cellular type with an absorbent structure.

[0026] Preferably, said cylindrical wall of said distribution roller is provided with an internal layer of non-absorbent material.

[0027] Advantageously, said non-absorbent material consists of expanded rubber with a non-absorbent structure.

[0028] Typically, said expanded rubber is of the cellular type with a non-absorbent structure.

[0029] Preferably, said cylindrical wall of said application roller consists of a layer of synthetic-fibre felt.

[0030] Typically, said cylindrical wall of said metering roller consists of a layer of synthetic-fibre felt.

[0031] The device according to the invention has the advantage that it allows direct transfer of the liquid to the textile material by means of the mutual engagement of the distribution and application rollers and the textile material located between them and in direct contact with both of them. This favours an optimum absorption and uniform distribution of the liquid inside the structure of the textile material.

[0032] Another advantage consists in the possibility of regulating, with precision, the quantity of liquid absorbed by the textile material by varying the degree of penetration of the application roller into the cylindrical wall of the distribution roller.

[0033] A further advantage consists in the possibility of regulating the quantity of liquid which is absorbed by the distribution roller and ensuring its uniform distribution by varying the degree of penetration of the metering roller into the cylindrical wall of the distribution roller.

[0034] In addition to this, the device according to the invention is simple, practical, has a low cost and very low energy consumption.

[0035] Further characteristic features and advantages of the invention will now be illustrated with reference to the embodiments shown by way of a non-limiting example in the accompanying drawings in which:

Fig. 1 is a front view of a device for moistening a continuous textile material, provided in accordance with the invention;

Fig. 2 is a cross-sectional view along the plane indicated by II-II in Fig. 1.

[0036] Figs. 1 and 2 show a device 1 for moistening a continuous textile material 2. The device 1 comprises a tray 3, containing a liquid 4, such as water or a suitable aqueous solution. The device 1 also comprises a distribution roller 6 and an application roller 8. The distribution roller 6 is at least partially immersed in the liquid 4 and the application roller 8 engages with it, as will be shown further below. The device 1 also comprises a metering roller 9 which also engages with the distribution roller 6, as will be illustrated further below. The distribution roller 6, the application roller 8 and the metering roller 9 are rotatably supported on side panels 5 and 5' of the tray 3 by means of respective shafts 22, 11 and 12. The shafts 22, 11 and 12 are parallel.

[0037] The distribution roller 6 has a cylindrical wall 7 comprising a spongy and yielding external layer 7a made of liquid-absorbent material and a yielding internal layer 7b made of non liquid-absorbent material. The external layer 7a consists, for example, of expanded rubber which is preferably synthetic and of the cellular type with an absorbent structure. The internal layer 7b consists, for example, of expanded rubber of the cellular type with a non-absorbent structure.

[0038] The application roller 8 and the metering roller 9 have a respective non-absorbent cylindrical wall 88 and 89 consisting, for example, of a layer of synthetic-fibre felt.

[0039] The textile material 2 is wound around the application roller 8 and is located between it and the distribution roller 6. Thus, the textile material 2 is in contact with the cylindrical walls 7 and 88 of both the rollers 6 and 8. The textile material 2 travels in the direction of the arrows A, driven by known movement means, not shown, and causes rotation of the application roller 8 in the direction of the arrow B and the distribution roller 6 in the direction of the arrow C.

[0040] The cylindrical wall 99 of the metering roller 9 is in contact with the cylindrical wall 7 of the distribution roller 6. The distribution roller 6 rotates in the direction

of the arrow C and causes rotation of the metering roller 9 in the direction of the arrow D.

[0041] According to a variant, the distribution roller 6 is driven by means of a gearmotor 21 keyed to one end of the shaft 22 and arranged on the outside of one of the side panels 5 and 5' of the tray 3.

[0042] The ends of the shafts 11 and 12 are slidably supported in the side panels 5 and 5' of the tray 3 by means of movable supports 13, 13' and 14, 14'. The supports 13, 13' and 14, 14' are slidable in pairs of guides 19, 19' and 20, 20', respectively, mounted on the side panels 5 and 5' and are operationally connected to hydraulic or pneumatic pistons 15, 15' and 16, 16', respectively. The cylinders 15, 15' and 16, 16' are operated by electric or pneumatic actuators 17, 17' and 18, 18', respectively. The supports 13, 13' and 14, 14' are operated so as to slide in the direction of the arrows E so as to cause translation of the shafts 11 and 12 of the rollers 8 and 9 with respect to the side panels 5 and 5'. In this way, the rollers 8 and 9 vary their distance from the roller 6 and their cylindrical walls 88 and 99, respectively, compress a portion 77 and a portion 177, respectively, of the cylindrical wall 7 of the roller 6. The surface areas of the compressed portions 77 and 177 depend on the distance between the roller 6 and the rollers 8 and 9.

[0043] An instrument 10 for checking and regulating the level of the liquid 4 is housed inside the tray 3. The instrument 10 consists, for example, of a level measuring rod 23 which is displaceable vertically in the direction of the arrows F with respect to a graduated element 24.

[0044] A sensor 25, for example of the conductive type, which detects the presence or absence of liquid and activates introduction thereof into the tray 3 using known means, not shown, in order to keep the level at the set value, is inserted at the bottom end of the rod 22.

[0045] According to a variant, the instrument 10 may comprise a float and minimum or maximum level switches, or other means suitable for controlling and regulating the level of the liquid 4.

[0046] When the device 1 is in operation, the continuous textile material 2 to be moistened travels in the zone of engagement between the cylindrical wall 7 of the distribution roller 6 and the cylindrical wall 88 of the application roller 8 being in contact with both the cylindrical walls. The distribution roller 6 removes a certain quantity of the liquid 4 from the tray 3. The liquid absorbed by the external layer 7a of the roller 6 is regulated by the metering roller 9 by means of compression of the portion 177. The compression of the portion 177 causes a partial extraction of the liquid from the external layer 7a and uniform distribution thereof. Then, the external layer 7a of the roller 6 comes into contact with the textile material 2 which is pressed by the cylindrical wall 88 of the roller 8 against the portion 77. Thus, the entire structure of the textile material 2 is impregnated with the liquid 4.

[0047] As a result of the action of the actuators 18, 18' which effect the displacements of the pistons of the cylinders 16, 16' and the supports 14, 14', the cylindrical wall 99 of the metering roller 9 is moved towards or away from the cylindrical wall 7 of the distribution roller 6. In this way, the cylindrical wall 99 penetrates more or less deeply into the external layer 7a and compresses a more or less extensive portion 177, causing partial expulsion of the liquid 4 so as to regulate the quantity absorbed by the layer 7a and homogenise the distribution thereof.

[0048] A similar action is performed by the actuators 17, 17' which effect the displacements of the pistons of the cylinders 15, 15' and the supports 13, 13' By means of these displacements, the cylindrical wall 88 of the application roller 8 is moved towards or away from the cylindrical wall 7 of the distribution roller 6. In this way, the cylindrical wall 88 penetrates more or less deeply into the external layer 7a and compresses a more or less extensive portion 77 so as to remove from the layer a predetermined quantity of liquid which impregnates the textile material 2 located between the rollers 6 and 8.

[0049] Operation of the actuators 17, 17' and 18, 18', which is manual or electrically or pneumatically assisted, imparts an adjustable and predetermined axial translatory movement to the cylinders 15, 15' and 16, 16' which in turn cause sliding of the supports 13, 13' and 14, 14' in the respective pairs of guides 19, 19' and 20, 20', thus effecting the displacement of the shafts 11 and 12 perpendicularly with respect to their axes and causing the respective rollers 8 and 9 to move towards or away from the lining 7 of the roller 6.

[0050] As the liquid 4 is used up and its level inside the tray 3 diminishes, the sensor 25, at the bottom end of the rod 23, supplies a signal to the means for introduction of the liquid into the tray for restoration of the set level.

[0051] The continuous textile material 2 is driven forwards, as mentioned further above, by motor means and, in turn, causes rotation, by means of contact, of the rollers 8 and 6. The roller 6 transmits the movement, by means of contact, to the roller 9 so that the rollers 6, 8 and 9 rotate idle and substantially at the same speed as the textile material.

[0052] As mentioned, the roller 6 may be rotationally driven by the gearmotor 21 keyed to one end of the shaft 22. The speed of the gearmotor 21 and the roller 6 is adjustable and, preferably, is equal to the speed of feeding of the textile material 2 so that the roller 6, the textile material 2 and the roller 8 have the same speed, while the roller 9 is driven rotationally, as a result of contact, by the roller 6.

[0053] This variant is advantageous in that the motor-driven roller 6 assists the advancing movement of the textile material and minimises the longitudinal tension particularly in the case of textile materials which are sensitive to elongation stresses.

[0054] The device according to the invention is low-cost and compact and occupies a limited amount of space. It may form an accessory which can be combined

upstream or downstream with any machinery in which the textile material undergoes prior or subsequent treatment.

Claims

1. Device (1) for moistening a continuous textile material (2) comprising a distribution roller (6) capable of rotating, immersed, at least partially, in a prechosen liquid (4) and an application roller (8) capable of rotating and driven by said textile material (2), said application roller (8) being adjacent to said distribution roller (6), **characterized in that** said distribution roller (6) has a cylindrical wall (7) provided with a spongy and yielding external layer (7a) able to absorb said liquid, and said application roller (8) has a substantially non-absorbent cylindrical wall (88) around which said textile material (2) is wound, said wall (88) of said application roller (8) supporting said textile material (2) being able to engage with and compress a prechosen first portion (77) of said external layer (7a) of said distribution roller (6) so as to impregnate said textile material (2) with said liquid (4) and thus moisten it.

2. Device (1) according to Claim 1, **characterized in that** said application roller (8) is displaceable with respect to said distribution roller (6) so as to vary the surface area of said first compressed portion (77) of said external layer (7a) and thus regulate the moistening rate of said textile material (2).

3. Device (1) according to Claim 1, **characterized in that** it also comprises a metering roller (9) capable of rotating, adjacent to said distribution roller (6), said metering roller (9) having a substantially non-absorbent cylindrical wall (99) able to remain in contact with and compress a prechosen second portion (177) of said external layer (7a) of said distribution roller (6) in order to extract a part of said liquid (4) from said external layer (7a).

4. Device (1) according to Claim 3, **characterized in that** said metering roller (9) is displaceable with respect to said distribution roller (6) so as to vary the surface area of said second compressed portion (177) of said external layer (7a) and thus regulate the rate of absorption of said liquid (4) by said external layer (7a).

5. Device (1) according to Claim 1, **characterized in that** said distribution roller (6) is operationally connected to motor means (21) capable of causing it to rotate.

6. Device (1) according to Claim 1, **characterized in that** said external layer (7a) consists of expanded rubber with an absorbent structure.

7. Device (1) according to Claim 6, **characterized in that** said expanded rubber is of the cellular type with an absorbent structure.

8. Device (1) according to Claim 1, **characterized in that** said cylindrical wall (7) of said distribution roller (6) is provided with an internal layer (7b) of non-absorbent material.

9. Device (1) according to Claim 8, **characterized in that** said non-absorbent material consists of expanded rubber with a non-absorbent structure.

10. Device (1) according to Claim 9, **characterized in that** said expanded rubber is of the cellular type with a non-absorbent structure.

11. Device (1) according to Claim 1, **characterized in that** said cylindrical wall (88) of said application roller (8) consists of a layer of synthetic-fibre felt.

12. Device (1) according to Claim 3, **characterized in that** said cylindrical wall (99) of said metering roller (8) consists of a layer of synthetic-fibre felt.

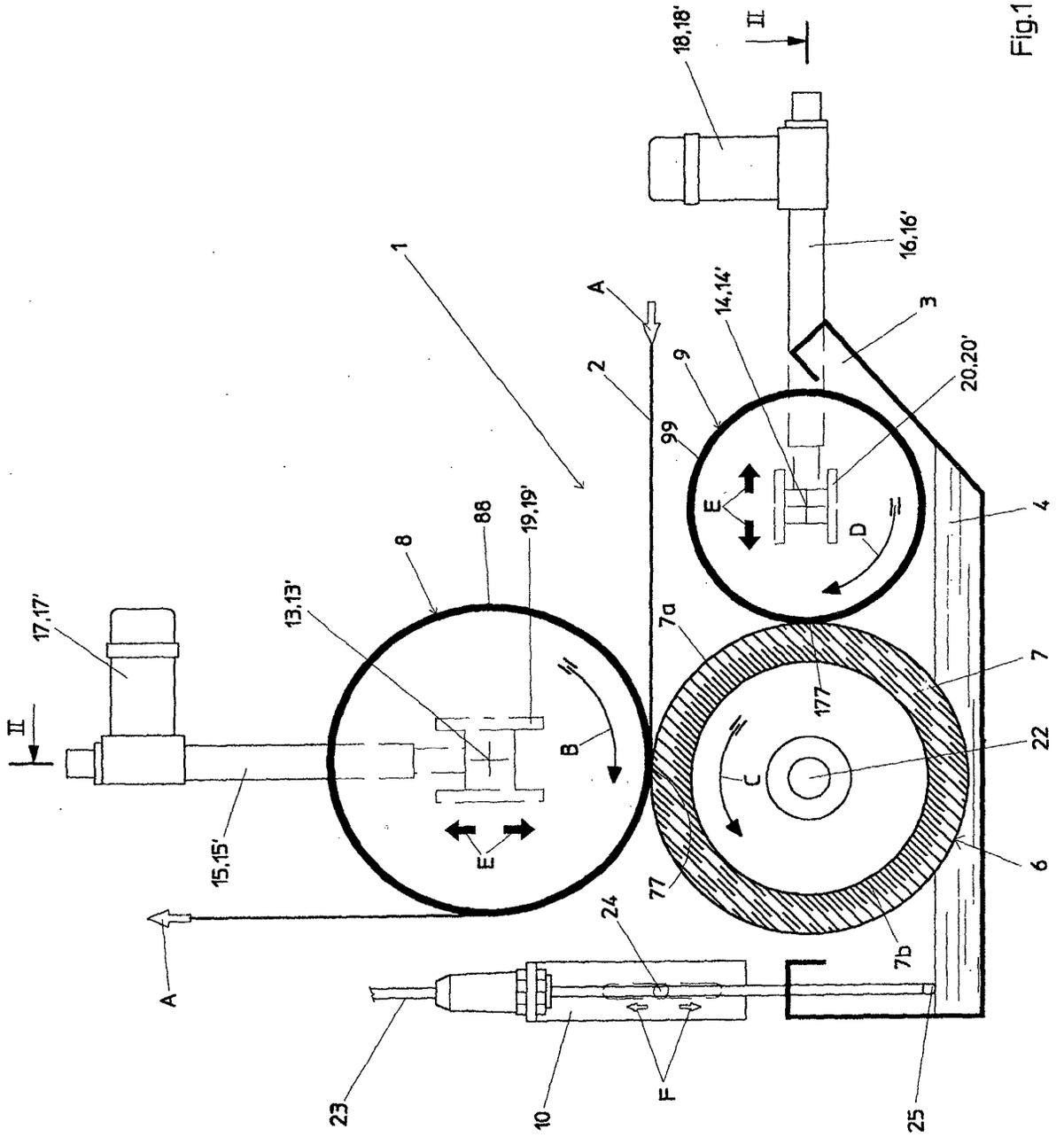
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Fig.1

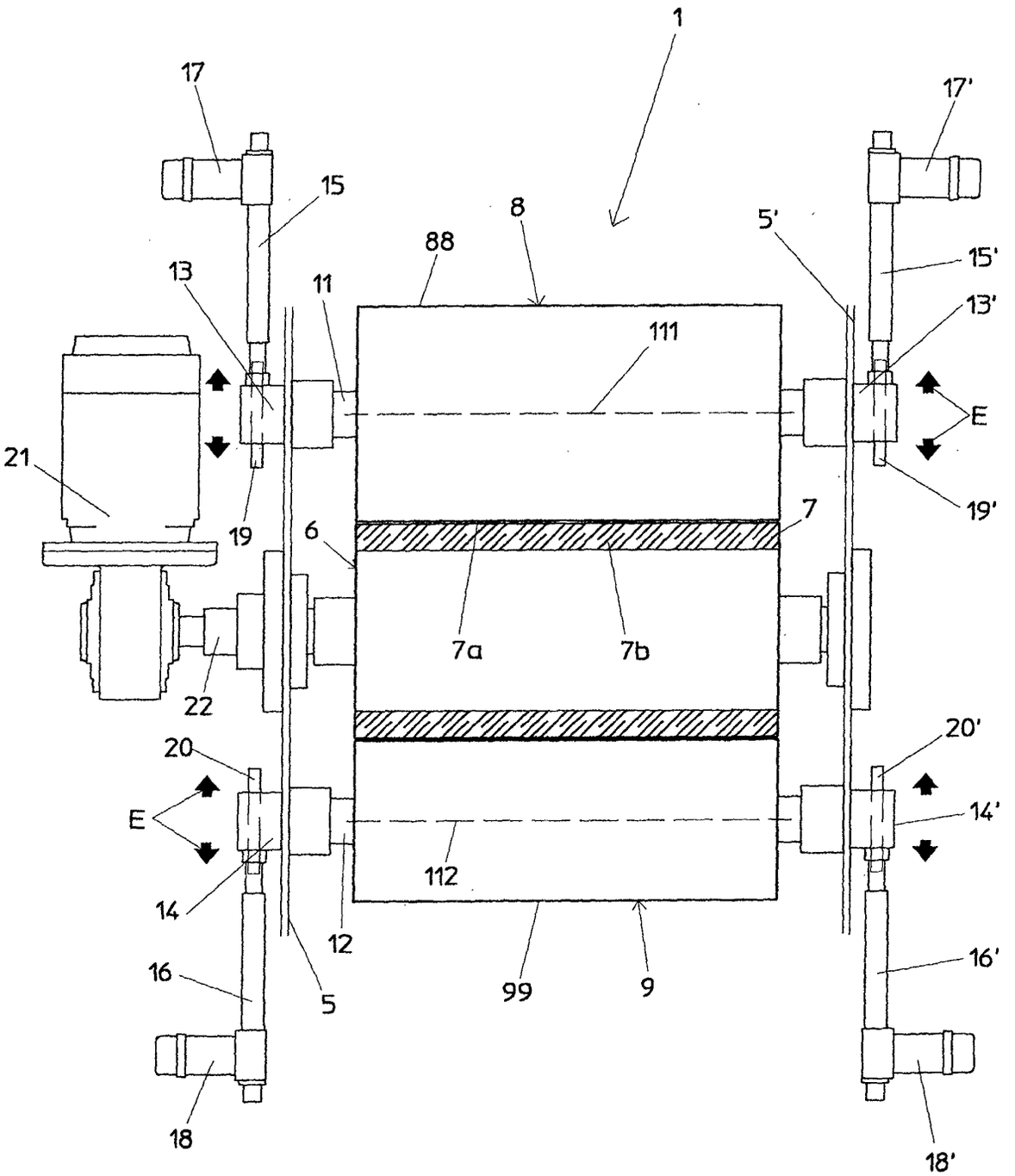
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Fig.2