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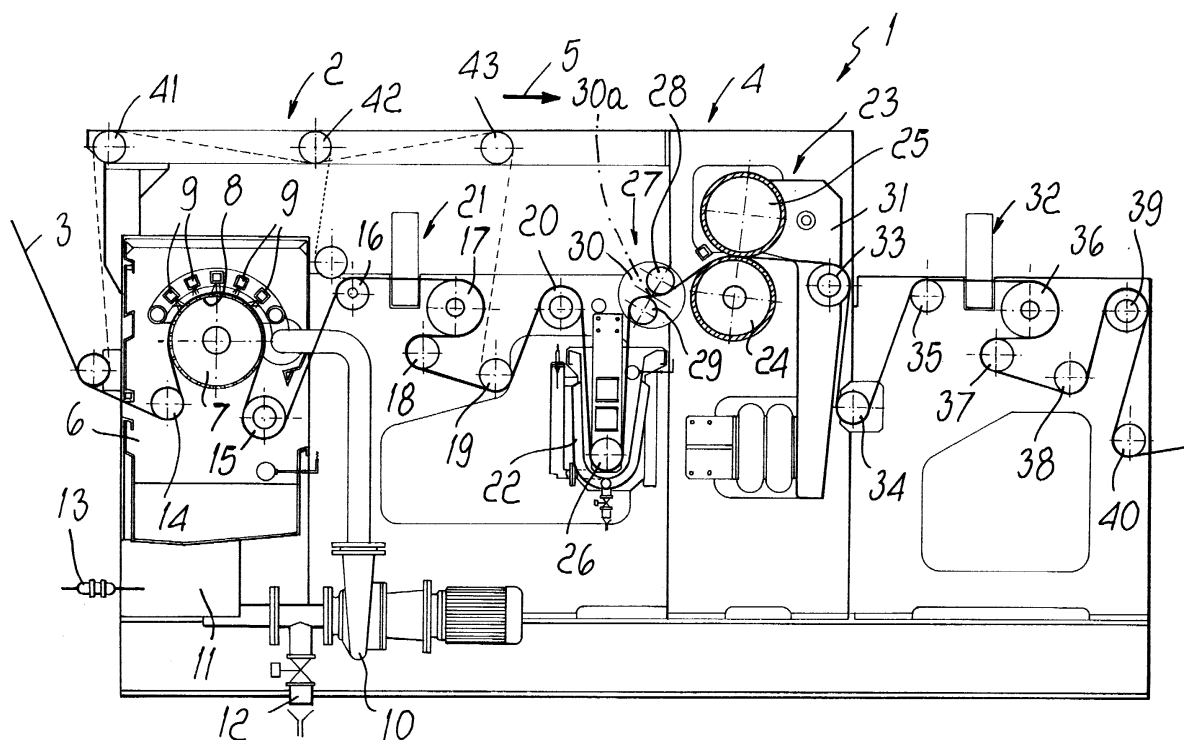
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(54) **Machine for continuously washing and finishing fabrics or the like**

(57) A machine for washing and subjecting to continuous finishing treatments textile products, such as fabrics or the like, dyed in an autoclave or dry textile products. The machine comprises a fabric washing station (2) and a finishing station (4) arranged downstream of the washing station (2) along the direction of advancement of the fabric (3). The washing station (2) comprises

a washing vat (6) which accommodates a drum (7) with a perforated lateral surface (8) which can be turned about its own axis, which lies horizontally, and supports, by means of its lateral surface, the fabric (3) that enters the washing station (2). Means (9) for dispensing a washing liquid are provided in the washing station (2) and are adapted to strike the fabric (3) that passes over the lateral surface (8) of the drum (7).



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Description

[0001] The present invention relates to a machine for washing and subjecting to continuous finishing treatments textile products, such as fabrics or the like, dyed in an autoclave or dry textile products.

[0002] It is known that fabrics, after weaving, are generally subjected to a plurality of treatments which usually comprise dyeing, washing, soaping and are performed in an autoclave; these treatments are followed by finishing treatments, such as wringing and fixing treatments, which are performed by means of an apparatus known as foulard machine; the fabrics are finally subjected to drying and tentering by means of a machine known as tenter.

[0003] The treatments performed in an autoclave have the advantage of providing fabrics which are free from creases, nipping, unraveling and weave displacements, but have the problem that they are unable to achieve effective washing of the fabric. Very often, filtration phenomena during the dyeing step or during the soaping treatment and subsequent treatments for solidification and/or with softeners cause problems due to uneven distribution of the products used on the fabric or poor solidity between the inside and the outside of the dyeing beam.

[0004] The unsatisfactory washing of the fabric can penalize the subsequent finishing treatments, since the residues of alkalinity and acidity carried by the fabric can cause the finishing bath to precipitate, reducing or even eliminating its effectiveness.

[0005] These problems very often lead to the presence of markings known as blemishes on the finished fabric.

[0006] The aim of the present invention is to solve the above-described problems, by providing a machine for washing and subjecting to continuous finishing treatments textile products, such as fabrics or the like, dyed in an autoclave, which allows to obtain on the fabric a high uniformity of distribution of the products used in the dyeing and finishing treatments, obtaining a finished fabric which is free from blemishes.

[0007] Within the scope of this aim, an object of the invention is to provide a machine which can also wash and finish textile products which are dry and hank-dyed or piece-dyed.

[0008] Another object of the invention is to provide a machine which avoids, at the end of the finishing treatments, residues of treatment products in the interstices of the weaves of the textile products, thus also improving the yield of the tenters and of the machines that perform the final drying of the textile products.

[0009] Another object of the invention is to provide a machine which allows a reduction in the overall dyeing and finishing times.

[0010] Another object of the invention is to provide a machine which allows savings in the products used for the treatments on the textile products.

[0011] Another object of the invention is to provide a machine which reduces the amount of textile product rejects due to poor impregnation.

[0012] This aim and these and other objects which will become better apparent hereinafter are achieved by a machine for washing and subjecting to continuous finishing treatments textile products, such as fabrics or the like, dyed in an autoclave or dry textile products, characterized in that it comprises a fabric washing station and a finishing station arranged downstream of said washing station along the direction of advancement of the fabric, said washing station comprising a washing vat which accommodates a drum with a perforated lateral surface which can be turned about its own axis, which lies horizontally, and supports, by means of its lateral surface, the fabric that enters said washing station, means for dispensing a washing liquid being provided, said means being adapted to strike the fabric on the lateral surface of said drum.

[0013] Further characteristics and advantages of the invention will become better apparent from the following detailed description of a preferred but not exclusive embodiment of the machine according to the invention, illustrated only by way of non-limitative example in the accompanying drawings, wherein the only figure is a schematic view of the machine according to the invention.

[0014] With reference to the above figure, the machine according to the invention, generally designated by the reference numeral 1, comprises a washing station 2 for the fabric 3 and a finishing station 4 which is arranged downstream of the washing station 2 along the direction of advancement of the fabric 3, indicated by the arrow 5.

[0015] It should be noted that the term "fabric" designates either an actual fabric with weft and warp or a knitted fabric or other type of similar textile product.

[0016] The washing station 2 comprises a washing vat 6 which accommodates a drum 7 which has a horizontal axis and can be actuated, for example by means of a conventional electric motor, not shown for the sake of simplicity, so that it rotates about its own axis. The drum 7 has a perforated lateral surface 8 which supports the fabric 3 in its advancement along the machine.

[0017] In the washing vat 6 there are provided means 9 for dispensing a washing liquid which are adapted to strike the fabric 3 that is rested continuously on a portion of the perforated lateral surface 8.

[0018] Preferably, the dispensing means 9 are arranged externally with respect to the drum 7 along a portion of an imaginary cylindrical surface which is coaxial to the drum 7 and faces the portion of the lateral surface 8 on which the fabric 3 passes.

[0019] The dispensing means 9 are preferably constituted by hollow bars which are supplied with the washing liquid and lie parallel to the axis of the drum 7. Said bars have, on their side directed toward the drum 7, an opening for dispensing the washing liquid which is shaped

like a longitudinal slot so that each bar dispenses a blade-like jet of pressurized liquid.

[0020] Preferably, the dispensing means 9 are orientated so that the dispensed washing liquid strikes the fabric 3 in its advancement direction 5.

[0021] The washing vat 6 is provided with a bottom where the washing liquid dispensed by the dispensing means 9 is collected.

[0022] The dispensing means 9 are supplied by means of a pump 10 which is connected, by means of its intake duct, to a tank 11 for inspecting the washing liquid. The washing liquid inspection tank 11 is connected to the bottom of the washing vat 6, and is provided with a discharge duct 12 by means of which it is possible to fully or partially discharge the washing liquid. The inspection tank 11 can be accessed in order to analyze the characteristics of the washing liquid and perform any corrections of its degree of acidity.

[0023] Moreover, inside the washing vat 6 there are provided heating means of a known type, not shown for the sake of simplicity, and means for controlling the temperature of the washing liquid, such as for example a temperature probe 13, are installed in the washing liquid inspection tank 11.

[0024] In this manner, the washing liquid dispensed by the dispensing means 9 has a degree of acidity and a temperature which are constantly controlled and kept at optimum levels for washing the fabric 3, despite any residues of products present on the fabric 3 that enters the washing station 2, following possible preceding treatments to which the fabric has already been subjected, such as for example dyeing performed inside an autoclave arranged upstream of the washing station 2.

[0025] The extent of the wrapping of the fabric 3 around the drum 8 is determined by a pair of guiding rollers, designated by the reference numerals 14 and 15, which are orientated so that their axes are parallel to the axis of the drum 7 and are supported, so as to move freely about their axes, by the supporting structure of the machine. Means for adjusting and measuring the tension of the fabric are conveniently provided on the guiding roller 15 and are constituted for example by load cells of a known type, not shown for the sake of simplicity.

[0026] In output from the washing station 2, the fabric 3 passes over a plurality of guiding rollers 16, 17, 18, 19 and 20 which convey the fabric 3 to the subsequent finishing station 4.

[0027] A first suction device 21 is provided between the washing station 2 and the finishing station 4, more specifically between the guiding roller 16 and the guiding roller 17, and is constituted for example by a conventional suction bar which aspirates the excess washing liquid from the fabric 3 that leaves the washing station 2.

[0028] The finishing station 4 comprises an impregnation tray 22 for the fabric 3 that arrives from the washing station 2 and a foulard unit 23 which is substantially

constituted by two wringing rollers, designated by the reference numerals 24 and 25 respectively, for the fabric 3 that leaves the impregnation tray 22.

[0029] The fabric 3 is guided, inside the impregnation tray 22, by a guiding roller 26 which is arranged so that its axis lies parallel to the axes of said other rollers and lies below the guiding roller 20 and a widening device 27.

[0030] The guiding roller 26 is fully immersed in the treatment liquid that is contained in the impregnation tray 22.

[0031] The impregnation tray 22 can be provided with lifting-lowering means by virtue of which it is possible to raise or lower said impregnation tray for cleaning or maintenance.

[0032] The widening device 27 comprises two widening rollers 28 and 29 which have substantially horizontal axes, are parallel to the axis of said other rollers, and are arranged side by side so as to form, between them, a passage for the fabric 3 that exits from the impregnation tray 22. The widening rollers 28 and 29 have a spiral-patterned lateral surface so as to apply to the fabric a force which is directed transversely to its longitudinal extension in order to achieve its widening. The widening rollers 28 and 29 are mounted on a supporting structure 30 which can rotate about an axis 30a which is arranged between the axes of the widening rollers 28 and 29, and said supporting structure 30 can rotate on command about its own axis 30a in order to vary the extension of the lateral surface of the widening rollers in contact with the fabric 3 and therefore in order to vary the extent of the widening of the fabric 3 according to requirements.

[0033] The pair of wringing rollers 24 and 25 comprises a first wringing roller 24 whose axis is substantially horizontal and parallel to the axes of said other rollers and can be rotationally actuated about its own axis, and a complementary wringing roller 25 which is arranged parallel to the wringing roller 24 and faces in an upward region said first wringing roller 24. The second wringing roller 25 is mounted on a movable structure 31 which can move in terms of elevation by way of conventional lifting means, so as to achieve a movement of the complementary wringing roller 25 toward or away from the wringing roller 24 in order to vary, by the chosen extent, the pressure applied by the wringing rollers 24 and 25 to the fabric 3 that passes between said wringing rollers.

[0034] Below the pair of wringing rollers 24 and 25 there is a recovery tray, not shown for the sake of simplicity, for the treatment liquid produced by the wringing performed by the pair of wringing rollers 24 and 25. The impregnation tray 22 is fed, according to a preset ratio, with the treatment liquid that arrives from the recovery tray and with fresh or regenerated treatment liquid.

[0035] Downstream of the finishing station 4 along the advancement direction 5 of the fabric 3, there is a second suction device 32 for aspirating the excess treatment liquid from the fabric 3 that leaves the foulard unit 23.

[0036] The second suction device 32 can be constituted, like the first suction device 21, by a conventional suction bar.

[0037] The second suction device 32 can be connected to the recovery tray, where the liquid that derives from the wringing of the fabric 3 performed by the wringing rollers 24 and 25 is collected so as to convey into said recovery tray also the treatment liquid that is aspirated by the second suction device 32.

[0038] The suction applied by the second suction device 32 is conveniently less powerful than the suction applied by the first suction device 21 and is meant to aspirate the liquid not from the fibers of the fabric but from the interstices between the weaves of the fabric 3. In this manner, the performance of the tenter and of the dryer located downstream of the machine according to the invention is improved, since one avoids soiling these devices with the finishing products without losing the intended effects in terms of hand, appearance, softness, anti-static properties, oil repellence, et cetera, given by the preceding treatments.

[0039] In output from the finishing station 4, the fabric 3 is guided, by means of guiding rollers, designated by the reference numerals 33 to 40, and conveyed to the devices, such as a tenter and a dryer, which are meant to perform further treatments of the fabric.

[0040] For the sake of completeness in description, it should be noted that above the washing station 2 there are guiding rollers 41, 42, 43 which can be used to divert the path followed by the fabric 3, so as to exclude it from the action of the washing station 2 and optionally from the first suction device 21.

[0041] It should be noted that at least some of the guiding rollers, such as for example the roller 17 and the roller 36, are motorized, optionally by means of variable-speed electric motors, in order to produce the advancement of the fabric 3 along the machine according to the invention.

[0042] Some of the guiding rollers, such as for example the roller 20, the roller 33 and the roller 39, can be equipped with means for adjusting or measuring the traction of the fabric by means of which it is possible to constantly control the degree of tension of the fabric 3 and optionally intervene, in a per se known manner, in order to vary said tension.

[0043] The operation of the machine according to the invention is as follows.

[0044] The fabric 3, which is dry or arrives from an autoclave in which it has been subjected to a dyeing treatment, is conveyed into the washing station 2, where by winding around a portion of the drum 7 it is struck by the washing liquid dispensed by the dispensing means 9. The particular type of washing performed by the dispensing means 9 on the fabric 3, arranged on a perforated cylindrical lateral surface 8 of the drum 7, produces an effective uniform removal of the residues of the preceding treatments and prevents the fabric from entraining residues of acidity or alkalinity which might com-

promise the subsequent finishing treatments.

[0045] The orientation of the dispensing means 9 causes the fabric 3 to be struck by blades of water which are uniformly distributed and do not produce longitudinal streaks on the fabric even in the case of pile fabrics or delicate fabrics.

[0046] The fabric 3 that leaves the washing station 2 is subjected to aspiration on the part of the first suction device 21, by means of which the excess washing liquid is eliminated from the fabric 3 and the humidity of the fabric is brought to an optimum level for the subsequent finishing operation.

[0047] The fabric 3 is then transferred into the finishing station 4, where it passes inside the impregnation tray 22; when it leaves the tray, it is subjected to the action of the widening device 27 and then wrung by the pair of wringing rollers 24 and 25 of the foulard unit. It should be noted that the wringing performed by the rollers 24 and 25 can be performed at low pressure so as to be able to use, in the impregnation tray 22, the most disparate products which are meant to solidify, soften, waterproof, elasticize et cetera the fabric 3.

[0048] The fabric 3 is then subjected to aspiration by the second suction device 32, which has the effect of adjusting the distribution of the treatment liquid with which the fabric 3 has been impregnated in the impregnation tray 22, removing the excess part that has deposited in the interstices of the weaves of the fabric. In this manner, the finished fabric 3 is free from unsightly blemishing.

[0049] The liquid produced by the wringing of the rollers 24 and 25 is returned to the impregnation tray 22 and mixed beforehand with fresh treatment liquid. In this manner, better homogenization of the foulard vat is achieved and dilution of the bath contained in the impregnation tray 22 is avoided.

[0050] In practice it has been observed that the machine according to the invention fully achieves the intended aim and objects, since it allows to obtain a finished fabric which is free from blemishing.

[0051] Another advantage of the machine according to the invention is that it reduces the treatment times and has compact dimensions.

[0052] The machine thus conceived is susceptible of numerous modifications and variations, all of which are within the scope of the inventive concept; all the details may furthermore be replaced with other technically equivalent elements.

[0053] In practice, the materials used, as well as the dimensions, may be any according to requirements and to the state of the art.

[0054] The disclosures in Italian Patent Application No. MI99A002545 from which this application claims priority are incorporated herein by reference.

[0055] Where technical features mentioned in any claim are followed by reference signs, those reference signs have been included for the sole purpose of increasing the intelligibility of the claims and accordingly,

such reference signs do not have any limiting effect on the interpretation of each element identified by way of example by such reference signs.

Claims

1. A machine for washing and subjecting to continuous finishing treatments textile products, such as fabrics or the like, dyed in an autoclave or dry textile products, characterized in that it comprises a fabric washing station and a finishing station arranged downstream of said washing station along the direction of advancement of the fabric, said washing station comprising a washing vat which accommodates a drum with a perforated lateral surface which can be turned about its own axis, which lies horizontally, and supports, by means of its lateral surface, the fabric that enters said washing station, means for dispensing a washing liquid being provided, said means being adapted to strike the fabric on the lateral surface of said drum.
2. The machine according to claim 1, characterized in that said dispensing means are arranged outside said drum and face the portion of the lateral surface of said drum that is engaged by the fabric.
3. The machine according to claims 1 and 2, characterized in that said dispensing means are arranged along a portion of an imaginary cylindrical surface which is coaxial to said drum and faces the portion of the perforated lateral surface of the drum over which the fabric passes.
4. The machine according to one or more of the preceding claims, characterized in that said dispensing means are constituted by hollow bars which are supplied with the washing liquid and are parallel to the axis of the drum; said hollow bars having, on their side directed toward said drum, an opening for dispensing the washing liquid which is shaped like a longitudinal slit for the dispensing, on the part of each one of said hollow bars, of a blade-shaped jet of liquid under pressure.
5. The machine according to one or more of the preceding claims, characterized in that said dispensing means are orientated so as to strike, with the washing liquid, said fabric along its advancement direction.
6. The machine according to one or more of the preceding claims, characterized in that between said washing vat and said finishing station there is a first suction device for aspirating the excess washing liquid from the fabric that leaves said washing vat.
7. The machine according to one or more of the preceding claims, characterized in that said finishing station comprises a tray for impregnating the fabric and a foulard unit which comprises two rollers for wringing the fabric that exits from said impregnation tray.
8. The machine according to one or more of the preceding claims, characterized in that downstream of said finishing station along the advancement direction of the fabric there is a second suction device for aspirating the excess liquid from the fabric that leaves said foulard unit.
9. The machine according to one or more of the preceding claims, characterized in that said dispensing means are supplied by a pump which is connected to a washing liquid inspection tank which is connected to said washing vat and is provided with a discharge duct for discharging the washing liquid, said inspection tank being accessible for the analysis and optional correction of the degree of acidity of the washing liquid.
10. The machine according to one or more of the preceding claims, characterized in that in said washing vat there are provided heating means and means for controlling the temperature of the washing liquid.
11. The machine according to one or more of the preceding claims, characterized in that it comprises means for adjusting and controlling the tension of the fabric in its advancement along the machine.
12. The machine according to one or more of the preceding claims, characterized in that in said impregnation tray there is a guiding roller which has a horizontal axis and is fully immersed in the liquid contained in said impregnation tray in order to guide the fabric inside said impregnation tray.
13. The machine according to one or more of the preceding claims, characterized in that said pair of wringing rollers comprises a first wringing roller which has a substantially horizontal axis and is actuated so as to rotate about its own axis and a complementary wringing roller which is arranged parallel to said first wringing roller and faces in an upward region said first wringing roller; said second wringing roller being movable on command toward or away from said first wringing roller in order to vary the pressure of said pair of wringing rollers on the fabric that passes between said pair of wringing rollers.
14. The machine according to one or more of the preceding claims, characterized in that below said pair of wringing rollers there is a tray for recovering the

liquid produced by the wringing performed by said pair of wringing rollers, said impregnation tray being supplied, according to a preset ratio, with the liquid that arrives from said recovery tray and with fresh or regenerated liquid.

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15. The machine according to one or more of the preceding claims, characterized in that said second suction device is connected to said recovery tray in order to convey into said recovery tray the liquid aspirated by said second suction device.

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16. The machine according to one or more of the preceding claims, characterized in that a fabric widening device is arranged between said impregnation tray and said pair of wringing rollers.

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17. The machine according to one or more of the preceding claims, characterized in that said fabric widening device comprises two widening rollers which have substantially horizontal axes and are arranged side by side so as to form, between them, a passage for the fabric that leaves said impregnation tray, said widening rollers having a spiral-patterned lateral surface.

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18. The machine according to one or more of the preceding claims, characterized in that said widening rollers are mounted on a supporting structure which can rotate on command about its axis, which lies between the axes of said widening rollers, said supporting structure being rotatable about its own axis in order to vary the extension of the lateral surface of said widening rollers that is in contact with the fabric.

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