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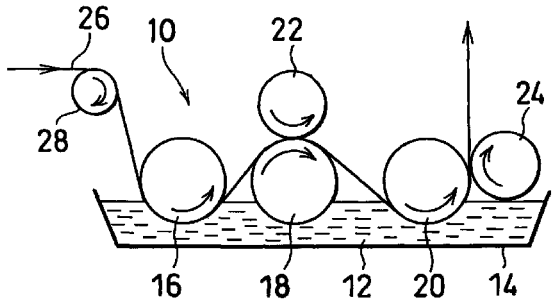
(54) Sizing apparatus

(57) A a sizing apparatus (10) includes a tank (14) containing a sizing liquid (12), a dip roller (20) for dipping a warp sheet (26) in the sizing liquid, and a squeeze roller (24) pressing the warp sheet against the dip roller (20). Generation of the under-sizing and the stop mark is controlled by having the squeeze roller (24) press the warp sheet with respect to the running direction of the warp sheet substantially in the horizontal direction against the downstream side of the dip roller (20).

FIG.1



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Description

BACKGROUND OF THE INVENTION

1. Field of the Invention

[0001] The present invention relates to a sizing apparatus for sizing warp yarns by means of both of a dip roller and a squeeze roller.

2. Description of the Prior Art

[0002] In a sizing apparatus, a plurality of warp yarns arranged in a sheet-like form (referred to as merely "warp sheet" hereinafter) are sized in general in the following manner. That is, the warp sheet extended over a dip roller in contact therewith is dipped in a sizing liquid stored in a tank thereof, and is then guided and pressed between a pair of upper and lower wring rollers, thereby removing the sizing liquid excessively taken up by the warp sheet while having the sizing liquid completely penetrated into respective warp yarns forming the warp sheet. The warp sheet wet with the sizing liquid is let off to or drawn into a drying apparatus provided in the next stage.

[0003] In case of the warp sheet formed of spun yarns such as spun wool, spun cotton and so forth, however, there is caused such a problem as it is hard to make the sizing liquid sufficiently penetrate into each warp yarn of the warp sheet by only executing a single wringing step and is also hard to perform the uniform sizing over the entire warp sheet. Thus, in order to obviate such a problem related to the sizing of spun yarns, there has been employed the twin or multiple squeezing method as a countermeasure, in which the following steps are carried out, for instance, again wringing the once dipped and wrung warp sheet before drying the sizing liquid, or again dipping the once wrung warp sheet in the sizing liquid tank and then wringing it before drying the sizing liquid, and so on.

[0004] Besides the problem as mentioned above, the prior art sizing apparatus still encounters other problems to be solved, for instance, under-sizing or insufficient sizing caused by a low speed operation of the apparatus, a stop mark caused by a stop motion of the apparatus for some reason or other. The under-sizing is caused by decrease in the sizing liquid quantity taken up by the sizing means during the low speed operation of the apparatus employed for exchanging warp beams or repairing broken warp yarns by warp tying or the like. The stop mark is formed by the sizing liquid standing in some place and being half-dried in air during the stop motion of the apparatus for exchanging warp beams or repairing broken warp yarns by warp tying or the like. This half-dried sizing liquid is moved together with the warp sheet, sticking thereto, when the apparatus is again started.

[0005] Therefore, it is important in the sizing apparatus to prevent occurrences of the under-sizing and the stop mark.

[0006] In the following description, terms "downstream" and "upstream" are used to identify the direction, the side, and the position of things and the force applied thereto as well with respect to the running direction of the warp sheet passing through the sizing apparatus.

SUMMARY OF THE INVENTION

[0007] The sizing apparatus of the invention includes a tank containing a sizing liquid, a dip roller for dipping a warp sheet in the sizing liquid, and a squeeze roller pressing the warp sheet against the dip roller. The squeeze roller presses the warp sheet substantially in the horizontal direction against the downstream side of the dip roller with respect to the running direction of the warp sheet.

[0008] The warp sheet is extended over the dip roller in contact therewith, is then dipped in the sizing liquid, and is further pressed against the outer circumferential surface on the downstream side of the dip roller, thereby wringing the warp sheet to remove the sizing liquid excessively taken up thereby.

[0009] The dip roller functions as wring rollers to the warp sheet in cooperation with the squeeze roller while the squeeze roller presses the warp sheet against the downstream side section of the dip roller substantially in the horizontal direction. This enables to shorten the running distance of the warp sheet from the surface of the sizing liquid to which the warp sheet is dipped, to the position for wringing the warp sheet. Consequently, even in the low speed operation of the apparatus, there is no fear for the sizing liquid taken up by the warp sheet to run short for sufficiently sizing the warp sheet, so that the occurrence of the under-sizing can be controlled.

[0010] Furthermore, in the position for wringing the warp sheet, the squeeze roller presses the warp sheet against the downstream side of the dip roller substantially in the horizontal direction. With this, the sizing liquid as wrung out tends to drop into the sizing liquid tank due to its own weight. Consequently, there is little fear for the sizing liquid to continue to stay in the wring position, thus controlling formation of the stop mark.

[0011] According to the invention, the warp sheet is dipped by means of the dip roller and at the same time, it is pressed against the downstream side of the same dip roller substantially in the horizontal direction, whereby occurrences of the under-sizing and formation of the stop mark are controlled.

[0012] The sizing apparatus of the invention may further include a baffle plate arranged within the sizing liquid tank and located on the downstream side of the dip roller, projecting a part thereof out of the surface of the sizing liquid, thus preventing flowing of the sizing liquid toward the downstream side which is caused by the rotation of the utmost downstream dip roller.

[0013] The sizing apparatus of the invention may further include a sizing roller arranged on the upstream side of the dip roller with respect to the running direction of the warp sheet, a second squeeze roller pressing the warp sheet against the sizing roller, and an upstream dip roller arranged on the upstream side of the sizing roller with respect to the running direction of the warp sheet. With this structure, it becomes possible to surely size spun yarns.

BRIEF DESCRIPTION OF THE DRAWINGS

[0014]

Fig. 1 is a schematic illustration of a sizing apparatus according to the invention; and

Fig. 2 is a diagram for explaining the positional relation between an utmost downstream dip roller and a squeeze roller and also explaining the outflow direction of a warp sheet after final wring thereof.

PREFERRED EMBODIMENTS OF THE INVENTION

[0015] Referring to Fig. 1, a sizing apparatus 10 includes a sizing liquid tank or reservoir 14 having an opening opened upward and storing a sizing liquid 12, three of rollers 16, 18 and 20 dipped in part in the sizing liquid 12, and two squeeze rollers 22 and 24. A sheete-like warp group, i. e., a warp sheet 26 formed by arranging a plurality of warp yarns in the form of a sheet is extended over a guide roller 28 and guided to the sizing apparatus 10.

[0016] The roller 16 is an upstream dip roller for dipping the warp sheet 26 in the sizing liquid 12. The roller 18 is a sizing roller for squeezing or wringing the warp sheet 26 in cooperation with the upstream squeeze roller 22. The roller 20 is an utmost downstream dip roller for dipping the warp sheet 26 in the sizing liquid 12 and squeezing or wringing the dipped warp sheet 26 in cooperation with the downstream squeeze roller 24 in the utmost downstream position with respect to the running direction of the warp sheet 26. The rotating direction of each roller is indicated by an arrow in Fig. 1.

[0017] In the sizing apparatus 10, the warp sheet 26 is dipped in the sizing liquid 12 by the dip roller 16, and it is then first wrung on the upper side of the sizing roller 18, passing through a tiny gap provided between the upper side of the sizing roller 18 and the lower side of the squeeze roller 22. Then, the first wrung warp sheet 26 is again dipped in the sizing liquid 12 by the utmost downstream dip roller 20. This dipped warp sheet is further wrung finally by passing through another tiny gap provided between the downstream side of the utmost downstream dip roller 20 and the upstream side of the squeeze roller 24.

[0018] The squeeze roller 24 is disposed on the downstream side with respect to the running direction of the warp sheet 26 rather than the dip roller 20 to press the warp sheet 26 against the outer circumference on the downstream side section of the dip roller 20 substantially in the horizontal direction. With this arrangement, the warp sheet 26 is dipped in the sizing liquid 12 by the dip roller 20 as one of squeezing members or gwring members, and at the same time, there can be shortening of the running distance of warp yarns from the surface of the sizing liquid 12 to the final wring position. As the result of this, even if the low speed operation of the apparatus is executed for exchanging the warp beam or repairing broken warp yarns by warp tying, a sufficient sizing liquid quantity can be taken up and carried up to the final wring position by the dip roller 20 and the warp sheet 26 as well, so that there is no fear that the sizing liquid 12 runs short for sufficiently sizing the warp sheet, thus controlling the occurrence of the under-sizing.

[0019] Furthermore, in the final wring position, when the squeeze roller 24 presses the warp sheet 26 against the outer circumference on the downstream side of the dip roller 20 substantially in the horizontal direction, the sizing liquid as wrung out tends to drop into the sizing liquid tank due to its own weight, so that there is little fear for the sizing liquid continue to stay in the final wring position. Consequently, even if the apparatus is stopped for exchanging the warp beam or repairing broken yarns by warp tying, formation of the stop mark can be controlled.

[0020] Referring to Fig. 2, there is shown an angle θ between two lines, one being an imaginary line connecting the center of the dip roller 20 and that of the squeeze roller 24 with each other and the other being a horizontal line passing through the center of the dip roller 20. This angle θ can take a value in the range of +30° to -10° where the plus (+) indicates that the center of the squeeze roller 24 is above the horizontal line while the minus (-) indicates that the same is under the horizontal line.

[0021] If the angle θ exceeds +30° in the plus direction, the running distance of warp yarns from the sizing liquid surface to the final wring position becomes too long so that the under-sizing is apt to take place. Moreover, the sizing liquid as wrung out would not easily drop into the sizing liquid tank by its own weight so that the sizing liquid is apt to stay in the final wring position and to form the stop mark.

[0022] Contrary to the above, if the angle θ exceeds -10° in the minus direction, the sizing liquid as wrung out remains on the squeeze roller 24 or the warp sheet 26 and tends to newly form a mark on the warp sheet. Therefore, the relative position between two rollers 20 and 24 is preferably adjusted such that the angle θ takes a value in the range of +7° to +10°.

[0023] If the dip roller 20 has a metal surface made of stainless steel or the like, it is apt to radiate heat therefrom so that the sizing liquid applied to the warp sheet gels or comes to have a high viscosity on the metal surface. This helps the size liquid stick to the warp

sheet 26. Contrary to this, if the squeeze roller 24 is made of rubber, its surface is not easily cooled so that it is hard for the sizing liquid to gel. The dip roller 20 may be entirely made of metal, or only the surface layer thereof a predetermined thickness (depth) may be made as a metal layer. Likewise, the squeeze roller 24 may be entirely made of a rubber material or only the surface layer thereof of a predetermined thickness (depth) may be made of rubber.

[0024] Therefore, as shown in Fig. 2, it is preferable that the let-off direction of the warp sheet 26a out of the sizing apparatus 10 be slightly slanted toward the squeeze roller 24 with respect to the tangent line 30 at the contact point between the warp sheet 26 and both of rollers 20 and 24.

[0025] With this arrangement, the finally wrung warp sheet 26a does not take a course along the above tangent line but takes a path slanted a little to the side of the squeeze roller 24. Therefore, the gelled sizing liquid stuck on the surface of the dip roller 20 is prevented from being transferred to the surface of the finally wrung warp sheet 26a.

[0026] The sizing liquid flow directed to the downstream side caused by rotation of the utmost downstream dip roller 20 is prevented by a dashboard or baffle plate 32 as shown in Fig. 2. The baffle plate 32 is placed in the sizing liquid tank to project its upper part from the sizing liquid surface and is located on the downstream side of the final dip roller 20.

[0027] While the invention has been described so far by way of one embodiment according to the invention, it should not be limited thereby. For instance, the invention is applicable to the sizing apparatus including none of the dip roller 16, the sizing roller 18, and the squeeze roller 22. The invention can be changed and modified without departing from the gist of the invention.

Claims

1. A sizing apparatus (10) comprising a tank (14) containing a sizing liquid (12), a dip roller (20) for dipping a warp sheet (26) in said sizing liquid, and a squeeze roller (24) pressing said warp sheet against said dip roller (20), characterized in that said squeeze roller (24) presses said warp sheet against the downstream side of said dip roller (20) with respect to the running direction of the warp sheet substantially in the horizontal direction.

2. A sizing apparatus (10) as claimed in claim 1 further comprising a baffle plate (32) disposed within said tank (14) to be located more downstream than said dip roller (20) and to project a part thereof out of the surface of said sizing liquid (12).

3. A sizing apparatus (10) as claimed in claim 1 or 2 further comprising a sizing roller (18) arranged on the upstream side of said dip roller (20) with respect to the running direction of said warp sheet (26), a second squeeze roller (22) pressing said warp sheet against said sizing roller (18), and an upstream dip roller (16) arranged on the upstream side of said sizing roller (18) with respect to the running direction of said warp sheet.

4. A sizing apparatus (10) as claimed in any one of claims 1, 2 and 3, characterized in that an angle θ between an imaginary line connecting respective centers of said dip roller (20) and said squeeze roller (24) with each other and a horizontal line passing through the center of said dip roller (20), is in the range of +30° to -10° where the plus (+) indicates that the center of said squeeze roller (24) is above said horizontal line while the minus (-) indicates that the same is under said horizontal line.

5. A sizing apparatus (10) as claimed in claim 4, characterized in that said angle θ takes a value in the range of +7° to +10°.

6. A sizing apparatus (10) as claimed in any one of claims 1 through 5, wherein the surface layer having at least a predetermined thickness of said dip roller (20) may be made of a metal material while the surface layer having at least a predetermined thickness of said squeeze roller (24) may be made of a rubber material or the like.

7. A sizing apparatus as claimed in any one of claims 1 through 6, characterized in that the direction of the warp sheet (26a) let off from said sizing apparatus is slanted a little to the side of said squeeze roller (24) with respect to the tangent line (30) at the contact point between said warp sheet (26) and both of said dip roller (20) and said squeeze roller (24).

FIG. 1

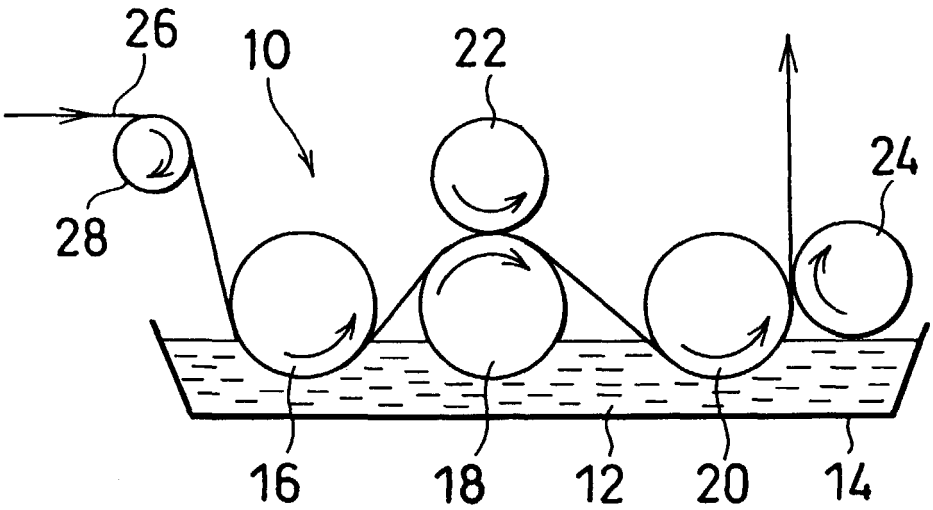

FIG. 2