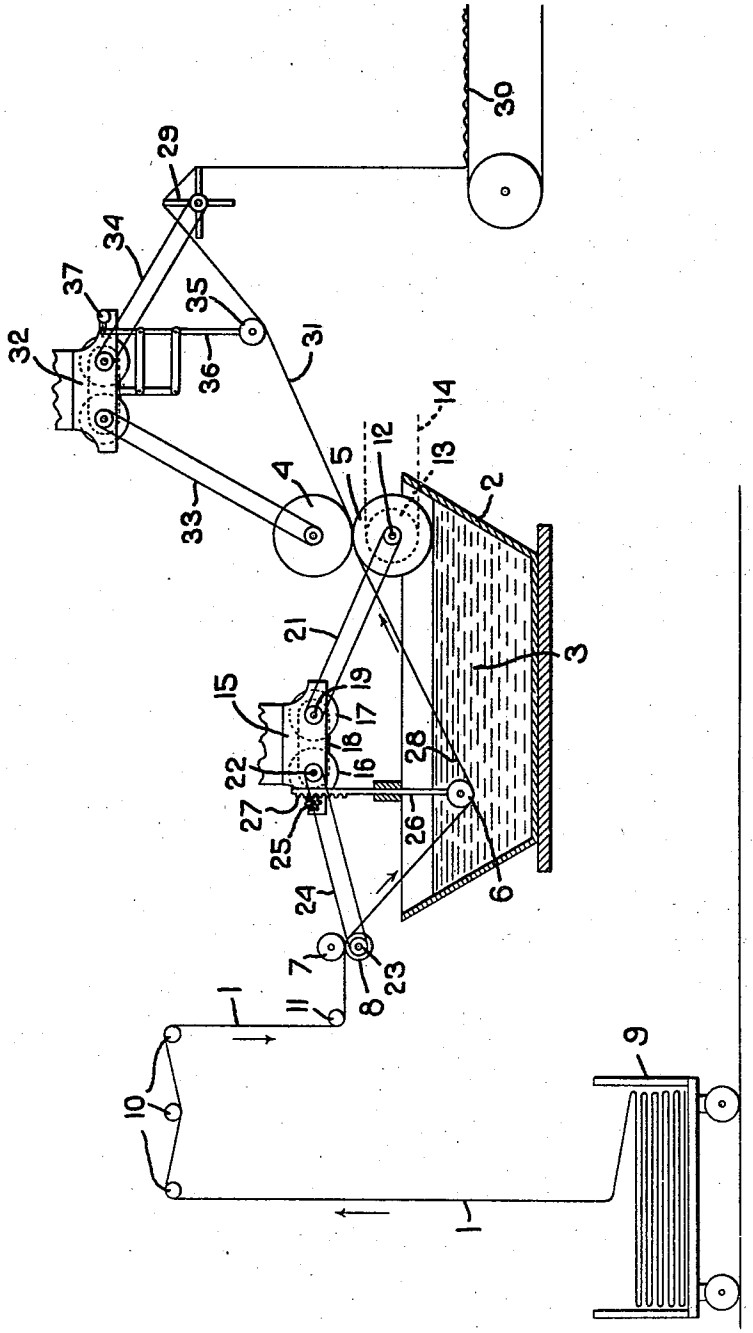
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MEANS FOR SHRINKING CLOTH

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MEANS FOR SHRINKING CLOTH

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10 Claims. (Cl. 68—22)

In shrinking cloth according to the method described in my co-pending application, Serial No. 261,461, filed March 13, 1939, the cloth is first wetted, thereby causing it to shrink, and it is then dried by a two-stage drying operation, the first or non-shrink producing stage being that portion of the drying operation during which no shrinkage occurs in the cloth, this being carried out while the cloth is held in a flat condition, and the second or shrink-producing stage being the final portion of the drying operation, during which the cloth has a marked tendency to shrink, this final stage being carried out by floatingly conveying the cloth through a drying chamber on a current of drying medium.

In order to obtain the full advantage of the tendency of the cloth to shrink when it is wet, it is desirable that the wetting of the cloth should be performed while the cloth is under little or no tension, because if the cloth is under tension while the moisture is being applied thereto and being absorbed thereby, the tension of the cloth will interfere with and prevent the true or normal wet shrinkage of the cloth.

Sometimes it is desirable to perform the shrinkage of the cloth simultaneously with some finishing operation and in such case, the wetting liquid may contain ingredients which it is desired to incorporate in the cloth to give it a desired finish. Under such circumstances, it is important that the cloth should be held flat and free from wrinkles during the wetting operation.

One object of my present invention is to provide a novel device by which the cloth is maintained under a light uniform tension and in a flat unwrinkled condition while it is fed to, acted on by and delivered from the cloth wetting device, which tension is insufficient to effect the true or normal shrinkage which the cloth undergoes by reason of being wet.

In order to give an understanding of my invention, I have illustrated in the drawing, somewhat diagrammatically, an apparatus embodying the invention.

In the drawing, the cloth which is to be wet shrunk is indicated at 1. Any suitable or known cloth-wetting means may be employed. That herein shown comprises an open tank 2 containing the wetting liquid 3, which may be water if the cloth is simply to be shrunk, but which may be a liquid containing some finishing ingredient such as starch or sizing, etc., if the cloth is to be subjected to a finishing operation simultaneously with the wet shrinkage thereof.

In the illustrated embodiment of the invention, the cloth is wet by passing it through the liquid 3 in the tank 2, and 4 and 5 indicate a pair of driven squeeze rolls which serve to deliver the wet cloth from the tank and, at the same time, to squeeze out surplus liquid therefrom. The cloth is shown as passing under a tension roll 6, which is submerged in the liquid 3.

The application of moisture to the cloth by its passage through the bath 3 and the absorption of the moisture by the cloth after it leaves the bath 3, produces in the cloth a marked tendency for the cloth to shrink so that if the cloth is not subjected to undue tension while it is passing through the bath or being delivered to the squeeze rolls 4 and 5, a decided wet shrinkage of the cloth will occur. As a result, the amount of cloth which is delivered from the squeeze rolls 4 and 5 is less than that which is delivered to the tank 2 by the amount of shrinkage.

In order to permit the cloth to have its normal or true wet shrinkage when it is passed through the liquid 3, I provide an input feeding device for feeding the cloth to the bath 3 and I also provide means for maintaining on the length of cloth 3 between the input feeding device and the squeeze rolls, a uniform light tension, which is sufficient to hold the cloth flat, but insufficient to interfere with the wet shrinkage of the cloth, due to the application of water thereto.

This input feeding device is shown as in the form of two feed rolls 7 and 8, between which the cloth 1 passes, and from which the cloth is delivered to the bath 3.

The cloth is herein shown as being taken from a truck 9, said cloth passing from the truck 9 over straightening bars 10 and thence passing around a guide roller 11 to the feeding rolls 7 and 8.

In order to maintain a light, uniform tension on the cloth between the feed rolls 7, 8 and the squeeze rolls 4, 5, notwithstanding the fact that the cloth undergoes wet shrinkage in passing from the feed rolls to the squeeze rolls, I have provided means for operating the feed rolls 7 and 8 at a slightly faster speed than the squeeze rolls 4 and 5 and have also provided means for maintaining automatically such a relation between the surface speed of the feed rolls 7 and 8 and that of the squeeze rolls 4 and 5, that the length of cloth between the feed rolls and the squeeze rolls will be maintained under a light, uniform tension, notwithstanding the wet shrinkage which occurs in the cloth.

The squeeze rolls 4 and 5 may be positively driven from any suitable source of power, and merely for illustrative purposes, I have shown the shaft 12 of the roll 5 as provided with a driving pulley 13, which is actuated by a driving belt 14 shown in dotted lines. In devices of this type, the two squeeze rolls are usually arranged to rotate in unison.

In accordance with my present invention, the feed rolls 7 and 8 are driven from the squeeze rolls 4 and 5 by some suitable variable speed driving means which is automatically controlled by the tension roll 6, thereby to maintain a surface speed of the feed rolls 7 and 8, such that the cloth will be fed to the cloth wetting device at the proper speed to maintain the desired light substantially constant tension on the cloth between the feed rolls and the squeeze rolls, notwithstanding any wet shrinkage which may take place in the cloth between said feed rolls and squeeze rolls.

For this purpose I may employ any suitable variable speed driving means which is controlled by the tension roll, and merely for illustrative purposes, but without intending to be limited thereto, I have shown somewhat diagrammatically at 15 a variable speed driving mechanism on the order of the well-known Reeves variable speed drive. This type of variable speed drive mechanism comprises two pulleys 16 and 17, which are connected by a belt 18 and have variable effective diameters. The shaft 19 of the pulley 17 is shown as belted to the shaft 12 of the squeeze roll 5 by suitable driving belt 21, and the shaft 22 of the pulley 16 is shown as belted to the shaft 23 of the feed roll 8 by means of a driving belt 24. The power for rotating the feed rolls 7 and 8 is thus taken from the squeeze rolls through the variable speed driving mechanism 15.

These variable speed driving mechanisms are provided with some suitable control, either mechanical, pneumatic, or electrical, by which the relation between the input speed and the output speed may be varied, and in the drawing, such control device is indicated at 25. Means are provided whereby this control device 25 may be actuated by the rise and fall of the tension roll 6. As illustrating one simple construction, the shaft of the roll 6 has an arm 26 rising therefrom, which is provided at its upper end with rack teeth 27 meshing with gear teeth with which the control device 25 is provided, said control device being in the form of a rotary element. The tension roll 6 is a relatively light roll having just sufficient weight to hold the length of cloth between the feed rolls 7 and 8 and the squeeze rolls 4 and 5 in a smooth condition. Said tension roll is set so that the length of cloth between the feed rolls and the squeeze rolls will be in the form of a wide loop 28, a portion of which is submerged in the bath 3.

So long as the feed rolls 7 and 8 are feeding the cloth to the bath 3 sufficiently faster than the squeeze rolls 4 and 5 deliver it from said bath to compensate for the wet shrinkage which occurs in the cloth, the loop 28 of the cloth will be maintained under the light uniform tension which is given it by the weight of the tension roll 6. If the feed rolls 7 and 8 tend to feed the cloth to the bath at a speed faster than that required to maintain the loop 28 of the length shown in the drawing, then the said loop tends to lengthen and the tension roll 6 will move downwardly. This downward movement will actuate the control device 25 to cause such a readjustment of the variable speed device 15 as to reduce the speed of the feed rolls 7 and 8. On the other hand, if the feed rolls 7 and 8 are feeding the cloth to the bath at a speed slower than that required to maintain the loop 28 at its normal length, then the shortening of the loop 28 will cause the tension roll 6 to rise, and this upward movement of the roll will actuate the control 25, thereby causing a re-adjustment of the variable speed device 15, which will result in increasing the speed of the feed rolls 7 and 8.

By this invention, therefore, the speed of the feed rolls 7 and 8 is automatically varied so as to cause said feed rolls to feed the cloth to the cloth wetting device at such a speed as to maintain on the cloth forming the loop 28, and which is being wet, the uniform light tension produced thereon by the weight of the tension roll 6.

The tension which the roll 6 applies to the cloth is not sufficient to interfere appreciably with the shrinkage which the cloth will undergo due to its becoming wet and absorbing moisture. In the above described construction, the wetting of the cloth is accomplished by its submergence in the bath 3 as it passes under the tension roll 6, but other known ways of wetting the cloth between the feed rolls 7, 8 and the squeeze rolls 4, 5, may be employed without departing from the inventive idea of providing means for feeding the cloth to the device and means for automatically controlling the speed at which the cloth is fed to the wetting device by the tension on the cloth between the feeding device and the squeeze rolls.

The wet shrunk cloth which is delivered from the squeeze rolls 4 and 5 passes over a driven cage roll 29 which delivers it to a traveling apron 30. This cage roll 29 serves to keep the cloth in a flat, unwrinkled condition, and to lay it evenly on the traveling apron 30. When the cage roll 29 is a driven roll, it is desirable that it should be so operated with relation to the squeeze rolls 4 and 5 that it will not exert on the stretch 31 of cloth between it and the squeeze rolls, sufficient tension to remove any of the wet shrinkage which the cloth obtained due to the wetting process. Moreover, during the time that the cloth is traveling from the squeeze rolls to the cage roll 29, the cloth will be absorbing the moisture which has been applied thereto, and during this moisture-absorbing interval, there will be a further tendency for the cloth to shrink.

In order to permit any such additional shrinkage to occur and at the same time to provide that the operation of the cage roll will not apply sufficient tension to the stretch 31 of cloth to remove the wet shrinkage of the cloth, I propose to operate the cage roll 29 from the squeeze rolls 4 and 5 through the medium of a variable speed driving mechanism, which is controlled by the tension on the length of cloth between the squeeze rolls and the cage roll.

For this purpose, there is shown a variable speed driving mechanism 32, which is connected to the squeeze roll 4 by suitable belt 33, and is connected to the cage roll 29 by another driving belt 34, so that the cage roll 29 will be driven from the squeeze roll 4 through the variable speed driving mechanism. 35 designates a light tension roll resting on the clutch between the squeeze rolls and the cage roll. This tension roll 35 has an arm 36 rising therefrom which is connected to the control device 37 of the variable speed mechanism. The arrangement is such that if the cage roll 29 tends to rotate slower than the squeeze rolls 4 and 5, so that the length of cloth 31 between the squeeze rolls and cage

roll tends to increase, the consequent downward movement of the tension roll 35 will actuate the variable speed device 32 to cause an increase in the speed of rotation of the cage roll. On the other hand, if the relation between the relation speeds of the cage roll and the squeeze rolls is such that the cage roll tends to deliver the cloth faster than it is delivered by the squeeze rolls, then the consequent upper movement of the tension roll 35 will actuate the variable speed device to cause a reduction in the speed of the cage roll. With this construction, therefore, the cloth is maintained under a light uniform tension while it is being wetted and also while it is absorbing moisture and until it is delivered onto the apron 30. This light tension is insufficient to interfer with the normal or true wet shrinkage which the cloth will undergo due to the application of moisture thereto and the absorption of moisture thereby. With my invention, therefore, it is possible to secure the normal true wet shrinkage of the cloth, while at the same time holding the cloth in a flat unwrinkled condition.

I claim:

1. Means for shrinking unshrunk cloth, comprising cloth-wetting means, cloth-feeding means to feed unshrunk cloth forward positively and deliver it to the cloth-wetting means, cloth-delivery means to withdraw the cloth from the cloth-wetting means, means for operating said cloth-feeding means and cloth-delivery means, cloth-tensioning means acting on the cloth between the cloth-feeding means and the cloth-delivery means, and means responsive to movement of the cloth-tensioning means due to variations in the length of the cloth between the cloth-feeding means and cloth-delivery means to vary correspondingly the relative cloth-advancing speeds of said cloth-feeding means and cloth-delivery means.

2. Means for shrinking cloth comprising cloth-wetting means, a pair of feed rolls for advancing cloth and feeding it to the cloth-wetting means, a pair of squeeze rolls to deliver the cloth from the cloth-wetting means, means to operate said feed rolls and squeeze rolls, a tensioning device to apply a light tension to the cloth between the feed rolls and the squeeze rolls, and means acting through said tensioning device and responsive to any variation in the length of the cloth between the feed rolls and squeeze rolls to vary correspondingly the relative cloth-advancing speeds of said feed rolls and squeeze rolls.

3. Means for shrinking cloth comprising cloth-wetting means, cloth-feeding means for advancing unshrunk cloth and feeding it to the cloth-wetting means, cloth-delivery means to deliver the cloth from the cloth-wetting means, means operatively connecting the cloth-feeding means and the cloth-delivery means, said latter means including a variable speed driving mechanism, and means responsive to any variations in the length of cloth between the cloth-feeding means and cloth-delivery means to adjust the variable speed driving mechanism and thereby vary the relative cloth-advancing speeds of said cloth-delivery means and cloth-feeding means.

4. Means for shrinking cloth comprising: a tank containing cloth-wetting liquid, cloth-feeding means to feed unshrunk cloth thereto, cloth delivery means to deliver wet and wet-shrunk cloth therefrom, a light tension roll submerged in the liquid in the tank and resting on the cloth between the feeding means and the delivery means, whereby the cloth passes through the liquid as it travels around said tension roll, and means responsive to a rising or falling movement of the tension roll to vary the cloth-advancing speed of the feeding means relative to that of the delivery means.

5. Means for shrinking cloth comprising: a tank containing cloth-wetting liquid, feed rolls for giving unshrunk cloth an advancing movement and feeding it to said tank, squeeze rolls for delivering wet and wet-shrunk cloth from the tank, a light tension roll submerged in the liquid in the tank and resting on the cloth between the feed rolls and the squeeze rolls, whereby the cloth passes through the cloth-wetting liquid as it travels around the tension roll, and means responsive to a rising or falling movement of the tension roll to vary the cloth-advancing speed of the feed rolls relative to that of the squeeze rolls.

6. Means for shrinking cloth comprising cloth-wetting means, means to feed unshrunk cloth thereto, cloth-delivery means to deliver the wet and wet-shrunk cloth from the wetting means, a rotary cloth-advancing member acting on the cloth after it has been delivered from the cloth-delivery means, a light tension roll engaging the cloth between the cloth-delivery means and the cloth-advancing member, and means responsive to any rising and falling movement of the tension roll to vary the relative cloth-advancing speeds of the cloth-delivery means and the cloth-advancing member and thereby maintain a cloth-advancing movement of the cloth-advancing member which is sufficiently slower than that of the cloth-delivery means to compensate for any additional shrinkage which takes place in the cloth between said cloth-delivery means and the cloth-advancing member.

7. Means for shrinking cloth comprising cloth-wetting means, cloth-feeding means to advance unshrunk cloth and feed it continuously to the cloth-wetting means, cloth-delivery means to withdraw the wet and the wet-shrunk cloth continuously from the cloth-wetting means, means, including a variable speed driving mechanism, operatively connecting the cloth-feeding means and the cloth-delivery means, a tension device to maintain a light tension on the cloth between the cloth-feeding means and the cloth-delivery means, and means controlled by the tension device to adjust the variable speed driving mechanism and thereby adjust the relative cloth-advancing speeds of the cloth-feeding means and the cloth-delivery means.

8. Means for shrinking cloth comprising cloth-wetting means, cloth-feeding means to advance unshrunk cloth and feed it continuously to the cloth-wetting means, cloth-delivery means to withdraw the wet and the wet-shrunk cloth continuously from the cloth-wetting means, means, including a variable speed driving mechanism, operatively connecting the cloth-feeding means and cloth-delivery means, a tension roll resting on the cloth between the cloth-feeding means and the cloth-delivery means and capable of a rising and falling movement as the length of cloth between the cloth-feeding and cloth-delivery means varies, and means responsive to the rising and falling movement of the tension roll for adjusting the variable speed driving mechanism and thereby varying the relative cloth-advancing speeds of the cloth-feeding mechanism and the cloth-delivery mechanism.

9. Means for shrinking cloth comprising cloth-wetting means, cloth-feeding means to advance unshrunk cloth and feed it continuously to the cloth-wetting means, cloth-delivery means to deliver the wet and wet-shrunk cloth continuously from the cloth-wetting means, a tension member engaging the cloth between the cloth-feeding means and the cloth-delivery means and applying a light tension thereto, and means responsive to movement of the tension member due to variations in shrinkage which take place in the cloth between the cloth-feeding means and the cloth-delivery means to vary correspondingly the relative cloth-advancing speeds of the cloth-feeding means and the cloth-delivery means.

10. Means for shrinking cloth comprising cloth-wetting means, feed rolls for advancing cloth and feeding it to the cloth-wetting means, a pair of squeeze rolls for delivering the cloth from the cloth-wetting means, tensioning means to maintain a light uniform tension on the cloth between the feed rolls and the squeeze rolls, and means responsive to movement of the tensioning means due to variations in the length of cloth between the feed rolls and the squeeze rolls to control the relative cloth-advancing speeds of said feed rolls and squeeze rolls.

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