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WARP, THREADS, YARNS, AND THE LIKE
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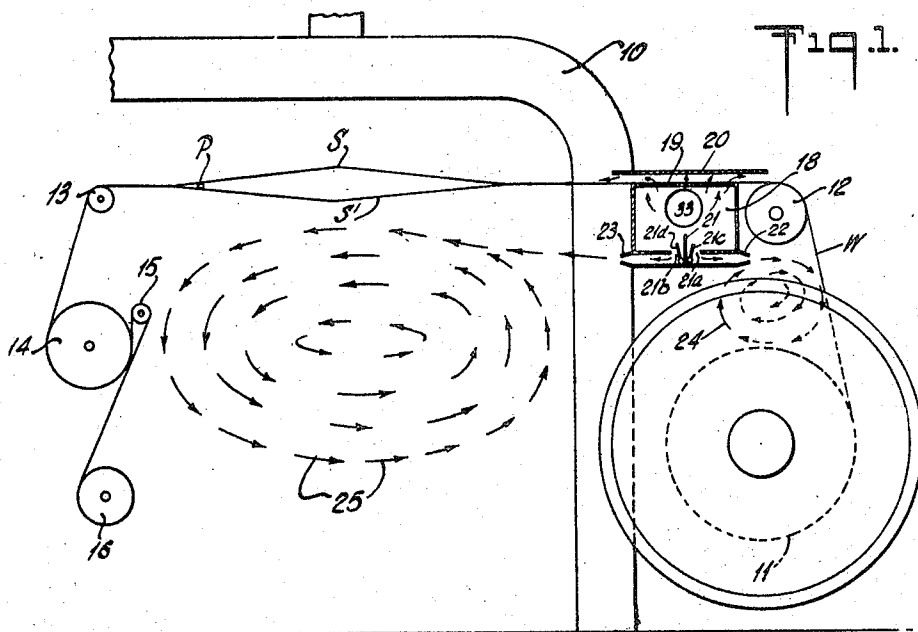
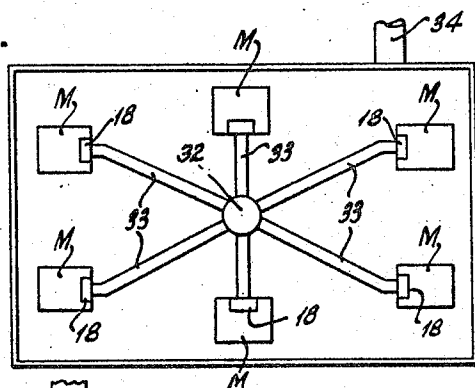
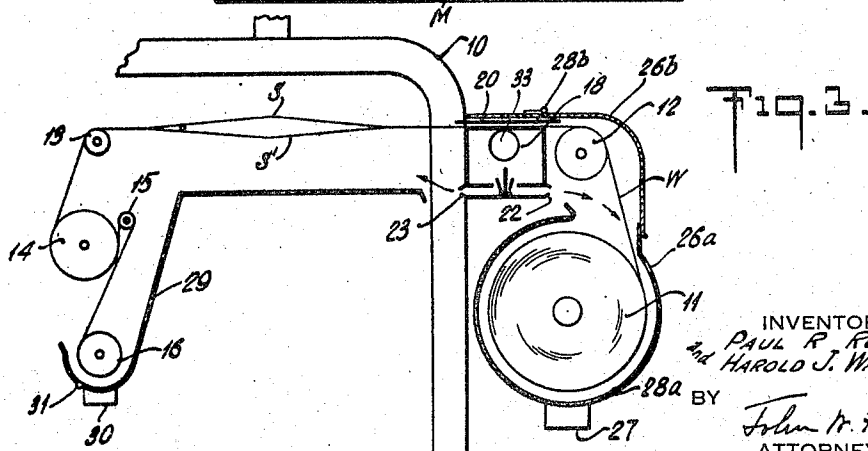


Fig. 2.



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METHOD AND APPARATUS FOR CONDITIONING WARP, THREADS, YARNS, AND THE LIKE

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This invention relates to method and means for improving the elasticity, meshing quality and tensile strength of threads, yarns and the like while they are being processed. More particularly it relates to the conditioning of elements of the cloth, such for example as warp, to give them the optimum moisture content for withstanding tension exerted thereon in the manufacture of said elements into cloth.

An object of the invention is to control the amount of moisture in warp and the like, while it is being woven, knitted or otherwise processed.

Another object of the invention is to effect a gradual transition in the moisture content of threads, yarns and the like while they are being woven, knitted or otherwise processed.

Another object of the invention is to provide method and means for giving yarn, threads and the like, in the form of warp or otherwise, the optimum moisture content for withstanding tension exerted thereon during processing, as for example in the operations of weaving or knitting.

Another object of the invention is to improve the tensile strength of yarns, threads and the like while they are passing into and through a machine by which they are subjected to tension.

Another object of the invention is to employ conditioned air to control the moisture content of threads, yarns, and the like, such for example as in warp, while they are being processed in a machine and to thereafter modify the atmosphere of the room in which the machine is contained.

Another object of the invention is to provide means for conditioning threads, yarns, and the like individual to each of a number of machines contained in a given closed space, combined with and related to means for exhausting air from said space to cause conditioning of said space by the air used to condition said threads, yarns, and the like.

Another object of the invention is to condition threads, yarns and the like in the individual machines in which they are being processed and to employ the conditioning air after its moisture content has been modified by its contact with said threads, yarns and the like to modify the temperature of the space in which said machines are located.

Another object of the invention is to use the same conditioned air to modify the moisture of threads, yarns and the like in individual machines comprising a group of machines contained in the same closed space, and to modify the temperature of said closed space.

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Other objects of the invention will be in part obvious or in part pointed out hereinafter.

The invention accordingly consists in the features of construction, combinations of elements, arrangements of parts, and in the several steps and relation and order of each of said steps to one or more of the others thereof, all as will be pointed out in the following description, and the scope of the application of which will be indicated in the following claims.

The invention will best be understood if the following description is read in connection with the drawings, in which,

Figure 1 shows in a side elevational view an embodiment of the invention in its application to warp during its fabrication into cloth in a loom;

Figure 2 is a diagrammatic representation of a mill room having therein a number of machines to which conditioned air is applied, individually; and

Figure 3 is similar to Figure 1 showing a machine equipped for directly recirculating part of the conditioned air after its exchange of moisture with threads or yarns being processed in said machine.

The term "warp" is used herein to include the application of our method to threads, yarns, and the like, generally, and not in a limited sense.

In accordance with our invention we bring into contact with threads, yarns and the like while they are being processed and are thus subject to tension, as for example the threads or yarns comprising a warp which are subject to tension during the steps of being fabricated into cloth by weaving or knitting, air which has been conditioned to give said threads or yarns a desired moisture content. For bringing moisture bearing air into contact with the said threads or yarns means are provided, adjacent to the path of travel of the said threads or yarns into and through a machine in which said threads or yarns are being treated, for creating a flow of conditioned air, or conditioned air modified by mixture with room air, or both, to effect moisture exchange with said threads or yarns.

We have described the invention herein in its application to looms. In Figures 1 and 3 there is shown the lower rear portion of a loom frame 10, the warp beam 11, the whip roll 12, and the warp W. In the operation of the loom, as is well known, warp W is drawn, or unrolled, from warp beam 11, and passes upwardly over whip roll 12, and then horizontally between the side frame members 10, into and through the loom mechanism, where, by known means, the warp

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may be divided into different planes or sheds, indicated schematically as S and S', and weft threads or picks p inserted between the sheds and beaten up to form woven cloth, which then passes over rolls such as 13, 14, and 15, to the cloth roll 16, to be rolled up thereon.

Adjacent to the path of travel of the warp I provide a conditioned air distributing unit or plenum chamber 18. The position of the chamber 18 along the path of the warp is a matter of choice, depending upon factors including the length and size of the machine to which the chamber is applied, and the length of the path of travel of the warp. It will be noted that in the loom structure I have indicated in Figures 1 and 3 the warp travels through three sides of a substantially rectangular path, moving, first upwardly from the warp beam 11 to the whip roll 12, then substantially horizontally from the whip roll 12 to roll 13, and then downwardly from roll 13 to cloth roll 16, and we prefer to position chamber 18 adjacent the horizontally extending portion of the path of the warp.

As illustrated herein chamber 18 is positioned between whip roll 12 and the frame 10 and just below the plane of the warp, and comprises an elongated rectangular member, comprising the terminus of an air duct and extending transversely of the warp W. It is provided with a foraminous surface 19 through the ports of which conditioned air delivered under pressure to chamber 18 is brought into contact with the travelling warp W by being directed against it substantially at right angles to the plane of the warp. Extending across the warp, on the opposite side of the warp from chamber 18, and in close proximity of the warp and preferably removably supported to give ready access to the warp, is a deflecting member or plate 20, which serves to deflect the air passing through the warp W from the ports of surface 19 and thereby to prolong its contact with the threads or yarns of the warp and its consequent exchange of moisture with said threads or yarns. The plate 20 may be of greater dimension longitudinally of the warp than the chamber 18 to prolong the period of contact between the conditioned air and the threads or yarns of the warp and to increase the moisture exchange therebetween.

It will thus be seen that a flow of moisture bearing air will be brought into contact with the threads or yarns of the warp directly, and will be caused to flow both between the individual yarns and threads comprising the warp and longitudinally of the warp threads and yarns, blanketing the threads or yarns in the space between chamber 18 and plate 20.

Chamber 18 is also provided with ports or vents adapted to discharge one or more streams of conditioned air to contact with the threads and yarns of the warp after entraining, and being modified by mixing with, room air. Thus as illustrated chamber 18 has therein the baffle 21 from either side of which air channels 21^a and 21^b communicate with nozzles 22 and 23 respectively, the nozzles 22 being positioned to direct a flow of conditioned air counter to the normal travel of the warp W, and the nozzles 23 being positioned to direct a flow of conditioned air in the direction of the normal travel of the warp W. Dampers 21^c and 21^d are provided for the air passages 21^a and 21^b respectively, whereby the volume of air which is permitted to flow to the nozzles is controlled, and the nozzles themselves are preferably adjustable as to size to control the jet speed with

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which the conditioned air passes through the nozzles. It will be seen that the stream of air from nozzles 22 will pass through room air for a distance before contacting the warp W in its upward flight between warp beam 11 and whip roll 12, long enough to entrain with it room air, which, by mixing with the conditioned air, tends to modify the moisture content of the mixed air coming in contact with the warp W, between warp beam 11 and whip roll 12, and so that the moisture bearing air contacting warp W during the first portion of its path of travel has not the same moisture content as that which comes into immediate and direct contact with the warp W, as from the ports of surface 19 of chamber 18 during the first part of the second portion of its travel, from whip roll 12 to roll 13. It will be seen that the mixed air comprising room air mixed with the conditioned air emitted from nozzles 22 will be deflected to a considerable extent by the warp W and will flow counter to the normal travel of the warp in a path such as indicated by arrow 24, and may be made to contact the warp threads or yarns while they are still rolled upon warp beam 11.

Similarly nozzles 23 will emit conditioned air which will entrain with it room air before coming into contact with the portion of the warp comprising the sheds S and S' and the cloth into which the warp is fabricated. It will be seen that the conditioned air from nozzles 23 will tend to set up a circulation of a mixture of conditioned air and room air, as indicated by arrows 25, within the space defined by the forward portion of the intermediate flight of the warp, between whip roll 12 and roll 13, and the downwardly extending flight of the warp between roll 13 and cloth roll 16.

Thus the conditioning of the warp threads or yarns may be initiated by a mixture of room air and conditioned air from nozzles 22 while the warp is still on warp beam 11, and gradually increased in extent until a maximum is obtained in passing through the space defined by the foraminous surface 19 of chamber 18 and the deflecting plate 20, after which the moisture content normal for the fibers comprising the threads or yarns of the warp at room temperature may be gradually restored by a mixture of room air and conditioned air from nozzles 23, which modifying action may be continued to the rolling up of the cloth into which the warp has been converted.

In Figure 3 I have shown warp beam 11 and whip roll 12 provided with overlapping hoods 26^a and 26^b by which, if desired, the mixture of room air and conditioned air from nozzles 22 may be collected after its moisture interchange with the warp W, and returned as through header 27, in order, for example, to remove from the air lint which it may have acquired due to its contact with the warp, and the collected air may, if desired, be returned to be conditioned and recirculated. To provide ready access to warp beam 11 and whip roll 12 portions of the hoods may be hinged as at 28^a and 28^b respectively.

Similarly hood means 29 is indicated by which the mixture of room air and conditioned air from nozzles 23, after moisture exchange with the forward portion of the warp and the cloth into which the warp is converted, may be collected and returned, as through header 30, to be reconditioned and recirculated, and to give ready access to the cloth roll 16 a portion of the hood 29 may be hinged as at 31.

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In Figure 2 I have indicated diagrammatically a unitary area such as a mill room in which are located a number of textile machines M each provided with an individual chamber 18 for re-
leasing conditioned air into contact with threads, yarns and the like while they are being subjected to tension during the operations of said machines individually. The chambers 18 may be individually supplied with conditioned air from a main supply duct 32, through branch ducts 33 communicating with the said chambers respectively.

Instead of collecting and recirculating the air discharged from chamber 18, after its exchange of moisture with warp W, it may be desired, particularly where a number of machines equipped with means, such as chamber 18, for bringing conditioned air into contact with threads and yarns while they are being subjected to tension therein, are contained within the same space or room, to utilize the discharged conditioned air, after its exchange of moisture with warp W, to condition the said space or room. For this purpose the room may be provided with an air outlet 34 which may if desired lead back to the air conditioning means. It will be seen that the conditioned air from the chambers 18, after exchange of moisture with the warp W, will pass into the room atmosphere in the lower stratum thereof, and since cool moist air tends to occupy the lowest level of the room it will serve to condition, and particularly to modify the temperature of the stratum of room air in contact with the loom attendants and other workers in the mill.

By providing a continuous flow of conditioned air through the main supply duct 32, and varying the amount of air supplied, not only may the yarns or threads be conditioned in the individual machines, but the air space in which the loom attendants and other mill workers are, may be conditioned, and both the moisture content of the threads or yarns in the individual machines and the temperature of the room may be maintained substantially constant throughout the year.

It will thus be seen that there has been provided by this invention a method and apparatus, in which the various objects hereinabove set forth together with many thoroughly practical advantages are successfully achieved. As various possible embodiments might be made of the mechanical features of the above invention and as the art herein described might be varied in various parts, all without departing from the scope of the invention, it is to be understood that all matter hereinbefore set forth or shown in the accompanying drawings is to be interpreted as illustrative and not in a limiting sense.

What we claim is:

1. In the manufacture of cloth in which elements of the cloth are advanced from a let-off roll to a take-up roll along a path forming substantially three sides of a rectangle the step of utilizing conditioned air from a single plenum chamber and discharging it against the travelling warp sheet in a plurality of streams so that the said warp sheet is contacted in different areas by streams of air differentially modified by mixture with room air.

2. In combination with textile apparatus in which a warp sheet is fabricated into cloth while passing from a let-off roll to a take-up roll along a path comprising substantially three sides of a rectangle, a plenum chamber positioned adjacent

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to said path and having a plurality of air vents directed toward different portions of said path and adapted to direct a plurality of streams of air against the travelling warp sheet from different distances, and means for supplying conditioned air to said plenum chamber.

3. In combination with textile apparatus in which a warp sheet is subjected to tension, a plenum chamber positioned adjacent the path of the warp sheet and characterized by having a plurality of outlets for directing conditioned air against the said warp sheet arranged at different angles relative to the warp sheet so that an increment of the conditioned air from the plenum chamber is directed substantially perpendicularly against the warp sheet from an outlet in close proximity to the warp sheet intermediate the ends of the path of the warp sheet through the said apparatus and immediately in advance of the application of tension to the threads of the warp sheet, and another increment of the conditioned air from said plenum chamber is directed at a portion of the warp sheet travelling through an end portion of its said path through said apparatus and further removed from said plenum chamber whereby the condition of said other increment of air is substantially modified by mixture with room air before contacting the warp sheet.

4. In combination with textile apparatus in which warp elements are led from a let-off roll to means by which they are subjected to tension and then to a take-up roll, means for simultaneously bringing differentially conditioned streams of air into contact with the warp sheet while it is travelling from said let-off roll to said take-up roll, said means comprising, a plenum chamber situated adjacent and below the path of the warp sheet intermediate the let-off roll and the take-up roll and in advance of the position in which the threads of the warp sheet are subjected to maximum tension, said chamber having a plurality of outlet means including upwardly extending outlets adjacent to the warp sheet, baffle means located above the warp sheet and extending parallel therewith opposite to said upwardly extending outlets of the plenum chamber and adapted to deflect air passing through the warp sheet longitudinally of the path of the warp sheet to prolong the contact between the air and the threads of the warp sheet, and other air outlet means adapted to discharge conditioned air from said plenum chamber at an angle with respect to said upwardly extending air outlets to direct conditioned air toward portions of the warp sheet removed from the portion against which the air from said upwardly extending outlets is directed, said other air outlet means being further removed from the path of the warp sheet than said upwardly extending outlet means whereby the condition of the air discharged therefrom is modified by mixture with room air before coming into contact with the warp sheet.

5. The method of operating a textile apparatus which comprises bringing conditioned air into contact with elements of textile material while being fabricated in said apparatus by discharging conditioned air against the elements from close proximity thereto just in advance of the place of application of maximum tension to said elements and setting up a flow of conditioned air modified by mixture with room air in a direction away from the place of application of maximum tension, and along circular paths, the boundary of which is partially defined by said elements.

6. In the operation of a textile apparatus in which a warp sheet is subjected to tension the method of conditioning the warp sheet which comprises the steps of (1) directing a flow of conditioned air mixed with room air against the warp sheet well in advance of the place of application of tension to effect an initial increase in the moisture content of the threads of said warp sheet (2) directing a flow of conditioned air substantially undiluted by mixture with room air against the warp sheet just in advance of the place of application of tension, and (3) directing against the warp sheet, beyond the said place of application of tension, a flow of conditioned air modified by mixture with room air to effect a gradual reduction in the moisture content of the warp sheet beyond the place of application of tension.

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