June 28, 1938. A. H. BEASLEY ET AL 2,122,000

HUMIDIFIER CONTROL APPARATUS

Filed Dec. 27, 1935 3 Sheets-Sheet 1

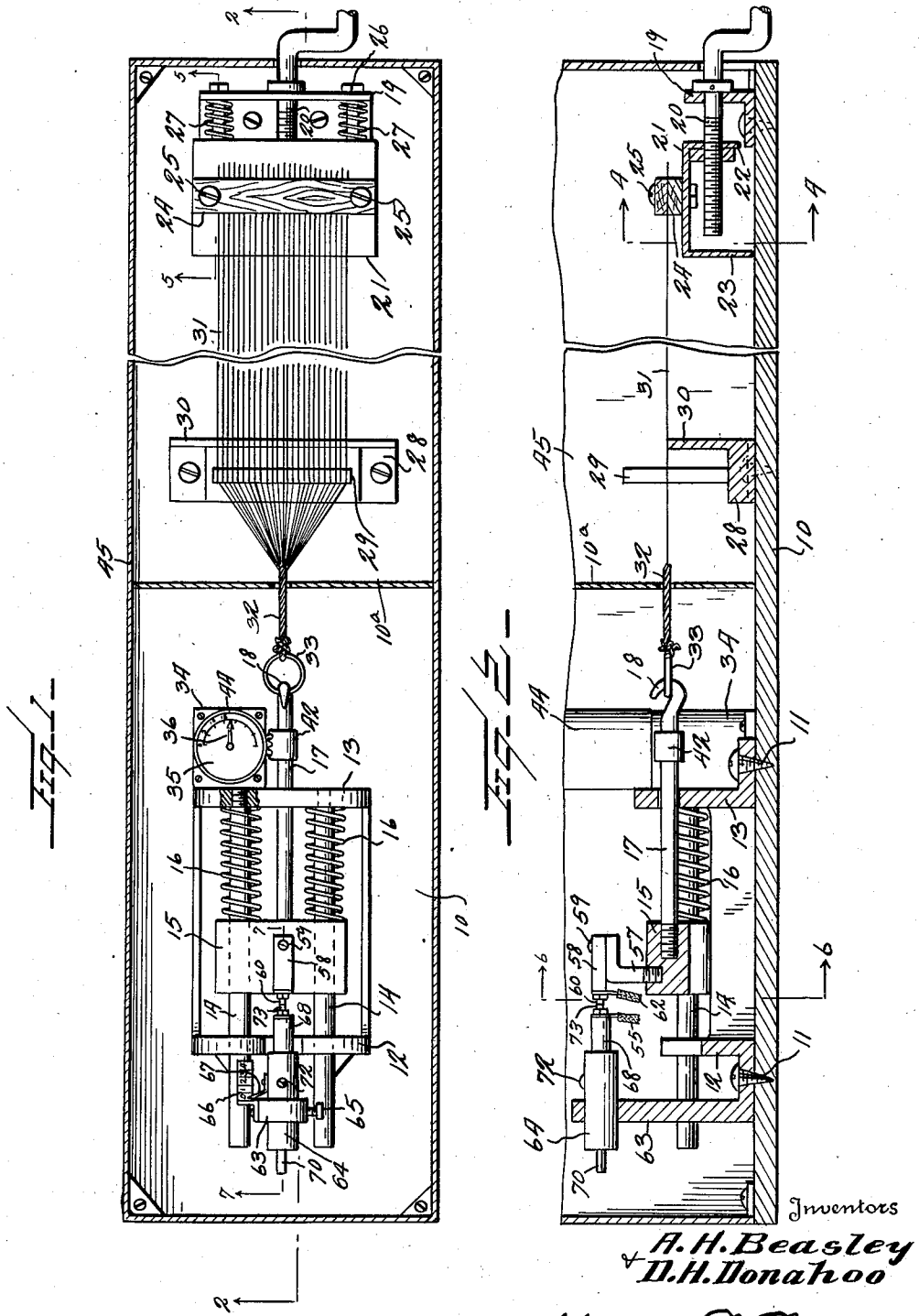


Fig. 1

Fig. 2

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Fig. 3.

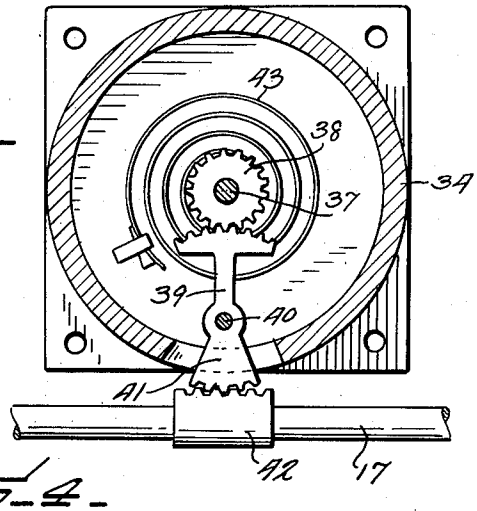


Fig. 4.

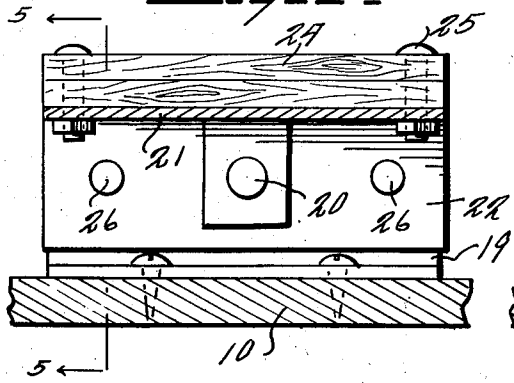


Fig. 5.

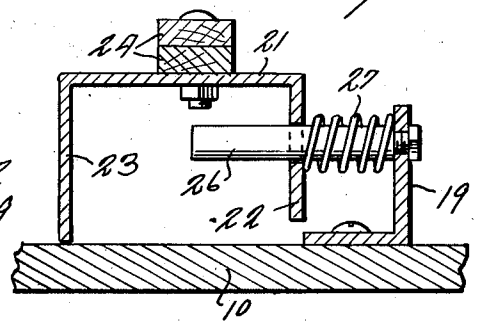


Fig. 6.

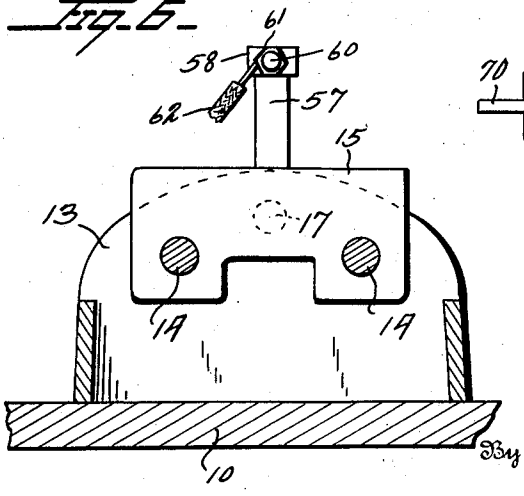
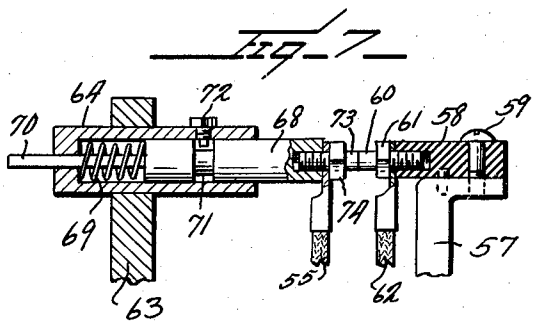


Fig. 7.



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Fig. 8.

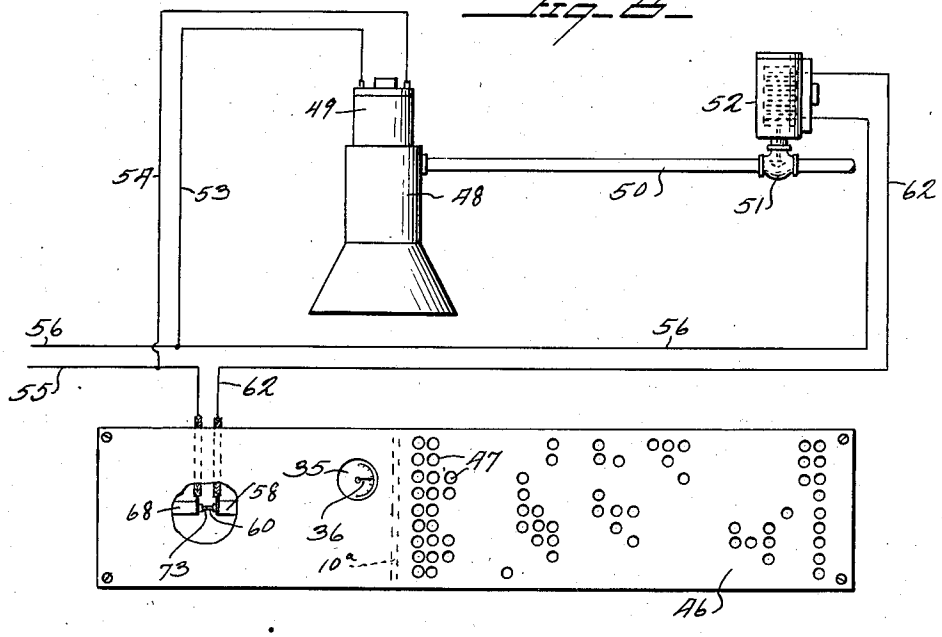


Fig. 9.

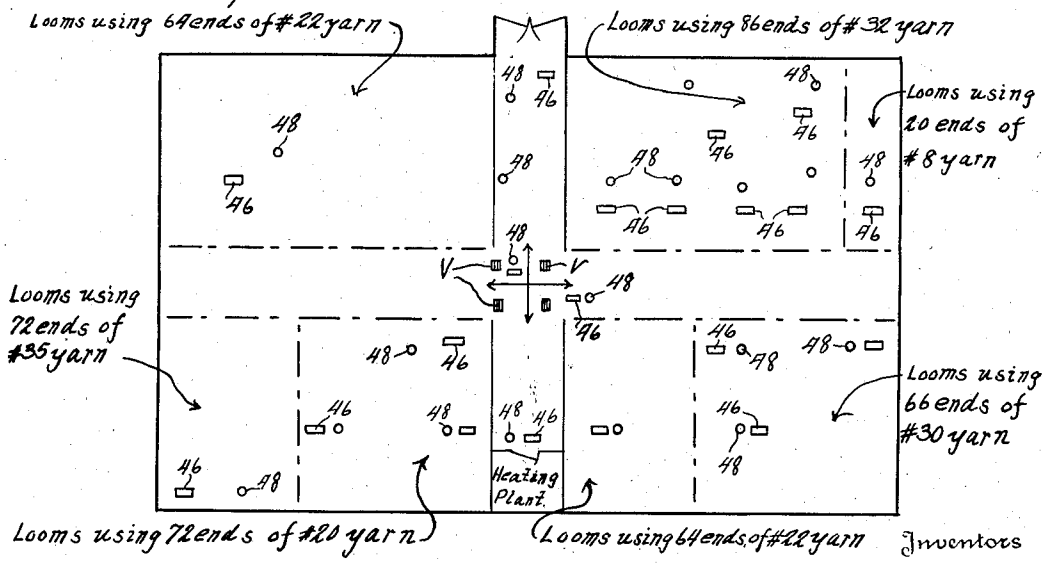
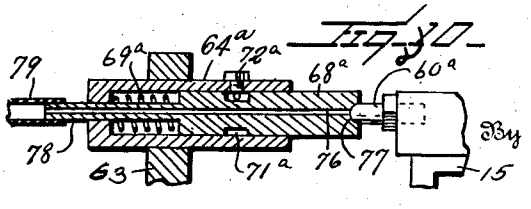


Fig. 10.



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UNITED STATES PATENT OFFICE

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HUMIDIFIER CONTROL APPARATUS

Archie H. Beasley and David H. Donahoo, Kannapolis, N. C.

Application December 27, 1935, Serial No. 56,369

17 Claims. (Cl. 236—44)

This invention relates to humidifying control apparatus and particularly to apparatus of this character as used in textile mills, this present application being a continuation in part of our application, Ser. No. 12,048, filed on the 20th day of March, 1935.

It is the general practice in textile mills to have humidifier controlling units but in this case only a few humidifier controlling units are in use in a mill because of the expensive nature of this controlling apparatus.

One of the objects of the present invention is to provide controlling apparatus for the same general purpose but which, due to its simplicity and the relative cheapness of manufacture, can be placed closer together within the mill and, therefore, keep a more uniform amount of humidity at particular points or sections in a mill, thus securing better humidification.

A further object in this connection is to provide a device of this character, several of which may be disposed within the same room or section of the mill but at different points therein so as to control the humidity of different sets of apparatus disposed in this room or section of the mill.

A further object is to provide a humidifying controlling mechanism in which control is secured primarily by the use of a plurality of threads or strands of the same yarn or other textile material as is being manufactured on the machines associated with the humidifying device, these threads or yarns having exactly the same characteristics in all respects as the threads or yarns used in the goods being manufactured, the number of such threads or yarns used in the controlling mechanism being in exact accordance with the square of the goods being manufactured.

A further object is to so construct this controlling mechanism that the threads or yarns used as the controlling factor may be placed under the same tension as the yarns being used in manufacturing the goods and that this tension may be manually adjustable.

Other objects will appear in the course of the following description.

Our invention is illustrated in the accompanying drawings wherein:—

Figure 1 is a top plan view of one form of controlling mechanism;

Figure 2 is a longitudinal sectional view thereof on the line 2—2 of Figure 1;

Figure 3 is a horizontal sectional view through the tension indicator;

Figure 4 is a section on the line 4—4 of Figure 2;

Figure 5 is a section on the line 5—5 of Figure 1;

Figure 6 is a section on the line 6—6 of Figure 2;

Figure 7 is a fragmentary section on the line 7—7 of Figure 1;

Figure 8 is a top plan view of the casing of the controlling mechanism partly broken away and showing diagrammatically the electrical connections to the controlling valve and to the motor of the moisture discharging head;

Figure 9 is a diagrammatic plan view of a mill showing a plurality of textile machines located in various portions of the mill and showing the relation of the humidifying apparatus thereto.

Figure 10 is a fragmentary longitudinal section on the same plane as Figure 7 but showing a modification used for controlling an air actuated valve.

Referring particularly now to Figures 1 to 8, 10 designates a base of any suitable material to which is securely fastened as by screws 11, the two angular members 12 and 13. Screwed into the angular member 13 are the two longitudinally extending rods 14, which rods pass through the member 12. These rods 14 are shown as having screw-threaded engagement with the vertical portion of the angular member 13. Mounted upon these rods 14 for sliding movement thereon is a slide or carriage 15 which is urged toward the left in Figure 1 by the springs 16 which surround the rods 14 and bear at one end against the angular member 13 and at the other against the slide or carriage 15. This slide or carriage 15 slides freely upon the rods 14 but is urged toward the left in Figure 5 by the spring 16. Extending loosely through the vertical portion of the angular member 13 is a rod 17 which is shown as having screw threaded engagement with the carriage 15. This rod at its outer end is formed with a hook 18.

Mounted upon the other end of the base 10 is an angular member 19 through which passes the shank of a screw 20. Having screw threaded engagement with the screw threaded shank 20 is a movable clamp designated generally 21, this clamp having a downwardly extending flange 22 through which the screw 20 passes and on its other side being formed with a downwardly extending flange 23 which rides upon the upper face of the base 10. Mounted upon the member 21 are the two clamping members 24 and 25 shown as being formed of wood, though we do not wish to be limited to this, and held to the carriage 21 by means of the screws or bolts 25.

Rods 26 extend through the angle iron 19 and extend loosely through the flange 22, and surrounding these rods are the springs 27 which urge the member 21 toward the left in Figure 1. When the screw 20 is turned in one direction, this sliding clamp 21 will be drawn rearward against the action of the springs 27, and when the screw is turned in the other direction, the clamp will be shifted forward or towards the member 13. Disposed between the sliding clamp 21 and the member 13 is an angular element 28 which carries upon it a comb 29 and also has an upwardly extending flange 30.

For the purpose of controlling the action of the slide 15, we provide a plurality of strands, threads or yarns designated 31, as shown in Figure 1. These strands at one end are clamped between the clamping elements 24 and pass between the dents of the comb 29 and then are converged and twisted, as at 32, and connected to a ring 33 which in turn is engaged over the hook 18. It will be seen that the contraction or expansion of these threads or yarns 31 will cause the rod 17 to move longitudinally in one direction or the other. When the threads contract, the rod 17 together with the slide 15 is shifted toward the right in Figure 1. When the threads expand, the springs 16 force the slide 15 toward the left in Figure 1.

For the purpose of indicating the amount of tension on the threads or yarns 31, we provide a tension indicator designated generally 34 in Figure 1. This has a dial 35 which is provided with graduations and over which graduations a pointer 36 passes. This pointer is attached to a vertical shaft 37, as shown in Figure 3, carrying upon it a gear wheel 38. Mounted within the casing of the indicator 34 is a pivoted arm 39 pivoted at 40 and having a gear segment 41. This segment engages with a rack tooth member 42 mounted upon the rod 17. It is to be understood that this rack tooth portion might be formed anywhere on the rod 17 that is convenient or along the slide 15 itself, in which case the indicator would be disposed opposite the slide 15. The coil spring 43 keeps the pointer 36 accurately set at all times. Above the dial 35 the casing is extended upward at 44 and the top plate 46 of the casing 45, which is mounted upon the base 10, has an opening coincident with this vertical extension 44 of the indicator casing, as shown in Figure 8, so that the indicator may be observed. This top plate 46 is perforated at 47 by a plurality of apertures, this apertured portion being substantially above the threads or yarns 31 so that the humidity of the room or loft in which this device is disposed may affect these yarns or threads.

It will be seen from Figure 8 there is provided a spray head or moistening head designated generally 48 and which may be of any suitable or usual construction but is shown as being provided with an electric motor 49 which, when it is energized acts to force a very fine spray of water downward from the head 48. This head 48 is connected by a pipe 50 to a valve casing 51 and disposed above this valve casing is an electrical valve actuating mechanism 52 which may be of any suitable construction. The particular valve used and the particular form of the electrical actuating means therefor forms no part of our invention and, therefore, we have not illustrated these parts in detail.

The motor 49 is connected by wires 53 and 54 to line wires 55 and 56. Thus the motor operates constantly but the supply of water is reduced or increased or cut off entirely, depending upon the operation of the controlling mechanism which has been described. To this end, there is mounted upon the carriage 15 a supporting bracket 57 which carries upon it the insulating block 58 held to the bracket 57 by means of a screw 59. Having screw threaded engagement with this insulating member is a contact point 60 carrying a binding nut 61 to which the terminal of a wire 62 is connected. This wire 62 extends to the valve operating mechanism contained within the casing 52, the other side of the electrically operated valve mechanism being connected to the wire 56 as previously stated. One wall of the angular element 12 is extended upward, as shown in Figure 2 at 63, and loosely disposed through an aperture of this upwardly extending wall 63 is a cylinder 64 closed at its outer end but open at its end confronting the bracket 57. This cylinder is held in adjusted position within the aperture in the wall or arm 63 by means of a screw 65, as shown in Figure 1. This screw permits the cylinder to be adjusted longitudinally through the aperture and then held in its adjusted position. The member 63 is provided with a scale 66 which extends parallel to the cylinder 64 and the cylinder 64 is provided with a pointer 67, as shown in Figure 1, which is coordinated with this scale 66 to indicate the adjustment of the cylinder. Operating within the cylinder 64 is a plunger 68, as shown in Figure 7. This plunger operates against a spring 69 carried within the cylinder, the plunger having a guide rod 70 which extends through this spring and out through the rear end of the cylinder 64. The plunger 68 is provided intermediate its length with an annular recess 71 and the cylinder carries a set screw 72 which engages in this recess. The point of this set screw is relatively small, as shown in Figure 7, while the recess is considerably larger in width than the diameter of the screw. Therefore, the plunger 68 may shift to a limited degree within the cylinder 64. The forward end of the plunger 68 carries upon it the contact point 73 which has screw threaded engagement with the extremity of the plunger and carries on it the clamping nut 74. Engaging this screw is the terminal of the line wire 55. Hence it will be seen that when the two contact points 60 and 73 are brought together a connection will be completed between the line wire 55 and the wire 62 and that current will pass from the line wire 55 to the wire 62, thence to the electrically actuated valve operating mechanism 52 and thence by wire 56 back to the source of current. So long as these contacts are together, so long will the valve 51 be opened to permit the passage of water to the spray head. As soon as these contacts 60 and 73 separate, however, the circuit will be broken through the controlling valve, the controlling valve will close, and this will cut off the water supply to the spray head.

It is to be particularly noted from the drawings, particularly from Figure 7, that as the threads or yarns 31 absorb moisture, they will contract and that this will cause a movement of the rod 17 and of the carriage 15 toward the right in Figures 1 and 7. The contact 60 will, therefore, move away from the contact 73 but by reason of the recess 71, the plunger 68 can follow up this rearward movement of the carriage 15 and the contact 60 to a limited degree and until the rear wall of the recess 71 strikes the set screw 72, the plunger 68 will follow up the rearward movement

of the carriage 15. Then the movement of the plunger 68 will stop and the carriage 15 will move on, breaking the contact between the contact members 60 and 73. It follows, therefore, that the circuit through the valve controlling mechanism 52 will not be broken immediately but that as the yarn or threads 31 contract, the carriage 15 will move rearward very gradually and the plunger will follow up without breaking the circuit until a predetermined regain has been secured. In adjusting this apparatus, the textile strands 31 are clamped in the clamp 24 and the ends of the strands are passed through the comb 29 twisted and tied to the ring 33 which is engaged with the hook 18. Tension is then applied to the yarn strands by means of the screw 20. Moisture is then applied to the yarn strands 31. As the yarn strands aborb moisture, the strands 31 contract and draw the bracket 57 with the contact 60 toward the right in Fig. 2. The operator keeps the plunger barrel 64 with its contact 75 pushed forward as the contact 60 moves toward the right. The operator watches the pointer 36 at the same time. Now when the pointer on the register stops, this means that the strands 31 have absorbed all the moisture which they will naturally take or have reached, in other words, the point of full absorbence. When the pointer 36 stops, the thumb screw 65 is tightened and at the same time, the current on the humidifying mechanism shown in Fig. 8 is cut off. Thus the cylinder 64 is set and the supply of moisture is cut off. The thumb screw 65 is then again loosened and a gauge is slipped between the contact points 60 and 75. This gauge may be, for instance, 1/6000" thick and thus when the switch in the humidifier circuit is again closed (assuming, of course, that the gauge has been removed) the circuit is broken through the instrument and an over-supply of moisture is held back. Now when the strands 31 start to dry out, the slide 15 moves to the left in Fig. 2, and as soon as it and the contact 60 have moved 1/6000", (assuming that the gauge is this thickness though much thinner gauges may be used if desired) the circuit to the humidifying mechanism will be again closed.

It is to be understood that each yarn or thread, depending upon its diameter and character, will naturally take up a certain definite amount of moisture and no more, and this amount so naturally absorbed will be different from the amount absorbed by a thread or yarn of a different size or having different characteristics. It follows, therefore, that merely to use threads or yarns not of the same character as the threads being woven or knitted will not accomplish the result desired because they will not have the same absorbence as the threads of the yarns being woven. They will reach full absorbence either quicker or less quickly than the threads being woven or knitted. Tests will readily show the full natural absorbence of any particular yarn or thread. When the pointer 36 stops its movement on the scale, full absorbence has been reached, as before explained, then the cylinder 64 is set by its scale 67 in correlation with the point of full natural absorbence so that at this point moisture will be cut off.

With our construction, therefore, there is not an immediate break prior to full natural absorbence of the yarn or thread, but while the strands 31 are contracting to a point where they will have received all the moisture they can absorb naturally, the plunger 68 and contact 75 follow up the movement of slide 15 and contact 60 and keep up the discharge of moisture to the air until such full natural absorbence has been reached. Then and not until then, does the movement of plunger 68 stop (limited by screw 72) and the instant after the circuit which includes the wires 55 and 62 and the motor for the humidifier is broken.

We do not wish to raise humidity beyond this point of full natural absorbence as raising the humidity beyond this point would render the threads or yarn being knitted or woven wet. The moisture is thus controlled and supplied by the demand of the specific thread or yarn. While the yarn or thread is absorbing moisture, the contacts 60 and 75 are in contact and the circuit to the humidifying mechanism closed. When this natural absorption stops, the yarn is not wet but has absorbed all of the moisture that it should. At this point, if the supply of moisture is not cut off immediately, the yarn becomes too wet.

By using the self-same thread or yarn in the strands 31 as the controlling element, there is no guess-work. The threads or yarns 31 control the percentage of moisture needed for the yarn or thread in the loom knitting machine, etc.

Yarn is slow to absorb moisture and slow to contract. With our construction, the gradual absorption of moisture is permitted without any break until full absorption has been reached and if a fraction of humidity is lost, the humidifier circuit is closed until the full natural absorption has again been reached.

This device does not do its work from dry to wet but from a natural amount of humidity to full absorbance of the yarn and from fractions lost in relative humidity back to full absorbance. When once properly connected up with the proper tension on the threads 31 (these threads, as before stated, having exactly the same characteristics as the threads or yarns being treated in this portion of the mill) no regulator key need be used, the control thereafter being absolutely automatic in every respect. By using yarns or threads of exactly the same character, processed in the same way, having the same twist and of identical character with the threads or yarn being used on the particular machine or machines with which the humidifier is associated, there can be no mistake made. If the threads on the machine or machines contract or expand, like contraction or expansion will occur with regard to the threads or yarns 31 and this will control the humidifier so that just the right amount of humidity will be discharged into the room or that portion of the room where the machines are.

It will be understood, of course, that the strands or yarns are composed of filaments which are twisted together and that the strands contract by a tighter twisting action and expand by an untwisting action and that the same thing will occur with the strands or yarns 31.

This device may be used in association with looms, spinning machines and all other textile machines where it is necessary that the humidity in the room in which the machine operates should have a certain constant such as to maintain in the warp threads of a loom, for instance, a certain definite amount of moisture equal to the full natural absorbence of these warp threads.

With our structure, it is possible, as shown in Figure 9, to place sets of machines in various portions of a room or loft and provide for the control of the humidity in any one section of the room in which certain machines are gathered. If the humidity is sufficient in any particular

section of the room, the spray head of that particular section will not operate, and if the humidity in that section goes down below a certain point, the humidifier will operate. Opened doors, ventilators, heating apparatus, etc. all tend to vary the air conditions in different sections of the mill, since at the present time, the controlling instruments are so expensive that only a few are placed in any one room of a mill. Our humidifier controlling mechanism is of such simple construction that many of them may be placed in different sections of a room, as shown in Figure 9, to control the humidity in any particular portion of the room or loft. The mechanism is so simple that there is practically nothing to get out of order and very little adjustment of the instrument is needed. The mill hands themselves can always repair or change the control strands 31 by supplying to the controller an exact sample of the yarn strands as are being manufactured.

We are aware of the fact that there are various controlling devices or hygrostats now on the market but these hygrostats, as far as known to us, use human hair, animal membranes, metal parts, etc., which are substances unlike the actual strands being woven or spun in the mills and these materials, which are unlike the textile fibres actually being used in the mill, do not control the cut-off valve on the water supply line as effectively and properly as will textile yarn strands of exactly the same character, processing and preparation as the strands being actually woven or spun on the weaving or spinning machines. Humidity regulators heretofore devised are set on a percentage basis or set to produce 65%, for instance. If this is enough to make the thread weave properly, very well. If this is not enough, another guess is made and, for instance, the regulator is set for 75%. If this is too much, then it is again set for 70%. With our humidity controlling element consisting of the strands 31, there is no guess-work in determining the amount of humidity as the threads or yarns 31 control the percentage needed for the yarn on the loom.

It is to be understood that even though the yarns being operated on and the yarns or threads used in the controlling mechanism are of the same number but of different twist, the apparatus would not work properly. It is necessary, therefore, that the yarn used in the controlling mechanism should be of exactly the same number, of the same identical character and have the same twist in order to secure a proper control of the humidifying element with relation to the yarn being operated on in the loom, spinning frame or like mechanism. Attention is called to the fact that yarn strands are twisted at 32 before being connected to the ring 33. This is for the specific purpose of allowing yarn in a single plane to twist and untwist without undue strain on the separate yarns or ends. This lengthens the life of the yarn used as the controlling element.

In humidifier controlling mechanisms heretofore devised, the amount of moisture present under normal or natural atmospheric conditions assists the twist to cause the yarn to contract and causes contact points to break away without any gain. This makes it necessary to use a key to calibrate or adjust the control mechanism. Our mechanism includes the plunger 68 operating within the adjustable cylinder 64 and this plunger holds the electrical contact 73 in engagement with the contact 60 until full absorbence is achieved. After yarn has absorbed all the humidity that it will, then it becomes too wet unless humidity is cut off. Our controlling mechanism does not work from dry to wet but from a natural amount of moisture to full absorbence and then from fractions lost in relative humidity. We achieve three purposes by our mechanism, namely, First, we eliminate entirely the necessity of using a key for calibrating purposes; second, we equalize the tension on the textile machines; third, we hold back relative gains after full absorbence of moisture in the yarn has been secured.

While we have illustrated an electrically actuated valve for controlling the passage of water to the spray head, it is to be understood that we do not wish to be limited to an electrically operated valve as the well known type of airport diaphragm valve with minor changes may be used.

In this instance, it will be necessary to use the modified form of controlling elements shown in Figure 10. In this figure, 63 designates the bracket and 64a the cylinder which is the equivalent of the cylinder 64 but is open at both ends. Within the cylinder is disposed a member 68a having limited sliding movement within the cylinder, this member 68a being provided with the annular groove 71a and the cylinder carrying the screw 72a which permits the limited sliding movement of the member 68a. This member 68a is provided with a longitudinally extending bore 76 and the end of the member 68a through which the bore extends is formed with a concave seat 77. The rear end of the cylinder 68a is prolonged at 78 and this is connected by a flexible hose connection 79. This flexible hose in turn is connected to an air line which leads to a diaphragm valve for controlling the water supply to the spray head. The diaphragm valve has a chamber above the diaphragm provided with an inlet opening and an outlet opening. The inlet opening is less in diameter than the outlet opening so that if the outlet opening be stopped for any reason, pressure will build up above the diaphragm and act to depress the water control valve against the action of a spring. Inasmuch as the construction of this form of diaphragm actuating valve is well known and forms no part of our invention, we have not illustrated it. Of course, with a diaphragm actuated valve, a different type of sprayer or atomizer will be used actuated upon a lifting of the diaphragm operated valve and closed when the diaphragm operated valve closes.

This is a well known type of spray head and, therefore, it is not deemed necessary to illustrate it, but we have deemed it necessary to show that in place of the contacts 60 and 75 that it is possible to pneumatically control the spray by either stopping the outlet from the diaphragm chamber by engagement of the plug 60a in the seat 77 or permit the discharge of the spray when the plug 60a mounted upon the carriage 15 is moved away from the seat 77. The cylinder 68a will follow up the movement of the carriage and of the plug 60a by reason of the spring 69a which has the same function as the spring 69.

Attention is called to the fact that there is a partition 10a disposed across the casing 10, this partition being disposed between the perforations 47 and the indicator 35. Through this partition there is an opening through which passes the twisted portion 32 of the yarn. The twisted portion 32 is to the left of this partition in Figure 1, while the yarn ends disposed all in a single plane are to the right of this partition. It is the yarn ends 31, therefore, which are disposed in this single plane which are exposed to

the moisture due to the perforations of the cover while the manually twisted portion 32 is to the right of the partition. Thus the yarn ends 31 will be moistened while the manually twisted portion will be more or less dry. Each of the single threads or yarn ends 31 will be forced to twist up as moisture is supplied, thus creating a strain on all single threads in a single plane by reason of the manually twisted portion being more or less dry. The twist that is due to the presence of moisture on the yarn ends 31 takes up or contracts the twisted portion 32 and thus acts upon the controlling mechanism as before described. The yarn ends 31 are exactly equal in number to the number of warp threads in a square inch of the goods being manufactured if the controller is used in connection with looms or is equal to the number of ends being spun on spinning frames. The initial tension given to the yarn ends 31 is to be the same as the initial tension of the warp threads or yarns on the loom or in the spinning frames. The tension on these warp threads or the roving on the spinning frames may be readily calculated by the ordinary instruments commonly used for this purpose.

In the operation of this device, after proper initial amount of tension is placed upon the yarns 31 by means of the screw 20, the indicator 35 will register this tension and the cylinder 64 is to be so set that its pointer 67 will be disposed on the same number as the number indicated by the pointer 36. Thus if the reading of the tension indicator should be 15, it will be necessary for the cylinder indicator 67 to also read 15. That means that as soon as the tension gets beyond 15, which is the tension which will be given by the proper amount of moisture, the contacts will break and the spray head will stop in its operation.

It is to be understood, assuming that the yarn ends 31 are bone dry, that moisture will be absorbed by the yarn ends until it is equalized with the natural moisture in the atmosphere. This, it may be assumed, will be less than the moisture necessary or desirable to be given to the yarn being treated. At this point, the springs 16 are still holding the contacts in engagement with each other and the spray will be operating.

As more moisture is absorbed by the yarns 31, the carriage will move further toward the right in Figure 1 or Figure 7, but as the carriage moves to the right, the plunger 68 will move with or in the same direction as the carriage, keeping contacts 61 and 75 closed until the desired amount of moisture has been absorbed, which depends upon the setting of the cylinder 64. At the point where the yarn 31 has taken up the amount of moisture necessary for the treatment of the yarns on machines with which the controller is associated and this yarn is just moist enough for proper treatment, the contraction of the yarn 31 withdraws contact 60 from contact 75 and the sprayer stops. If now there should be a fractional loss of moisture in the yarn, the carriage will move rearward under the action of the springs 16 and contact 60 will again engage the contact 75 until this fractional loss has been regained. As soon as this fractional loss has been regained, the contraction of the yarn 31 will retract the carriage to a point where the contacts will be broken and the spray head will stop.

It will be noticed that with our construction, the yarn ends 31 are held in a taut condition at all times so that expansion and contraction is transmitted to the rod 17 and the carriage 15.

In Figure 9, we have illustrated diagrammatically the general disposition of atomizing heads 48 and controlling means therefor as arranged on a mill floor, V indicating vents in the roof of the room at the intersection of transverse passages. We have also indicated on this diagram or plan the position of looms or other textile operating mechanism using various numbers of yarn and various ends or yarns to the inch. A controlling mechanism constructed in accordance with our invention is associated with each set of looms so as to keep each section of the mill floor and each set of looms properly humidified. Thus the humidification of looms using #22 yarn, 64 ends to the inch, requires a different humidification from the looms using, for instance, 66 ends of #30 yarn or 72 ends to the inch of #20 yarn. Where spindles are used as in spinning frames, the yarn strands 31 used in the controller would be equal to the number of spindles. If, for instance, there were 64 spindles with one yarn or end to each spindle, we would use 64 ends or threads in the controller having exactly the same number, twist, etc., as the yarn on the spindles. All sprays or humidifiers and all regulators are located overhead but the controllers would be located in the most convenient position where the number of ends may be changed by the workmen to suit the number of ends and character of the yarn used on the looms and spinning frames and, of course, these controllers would be associated with their appropriate looms or spinning frames.

There is a requisite or desirable amount of humidity for each specific number of yarn with its specific twist and its specific character, and experience has shown us that the only way to automatically control the amount of moisture for the specific yarn being treated is to use that same yarn as a controller. A single yarn or strand will not secure sufficient power to operate a controller which will in turn operate as our controller does against the action of certain springs and will operate to make and break contact. It is, therefore, necessary to use a plurality of yarn threads and in order to get the proper proportion of yarn threads, we use, as before stated, the same number of threads as there are warp threads in a square inch of goods being manufactured, or as there are rovings or yarns being spun, and it is necessary that these controlling yarns such as 31 in our drawings shall be placed under exactly the same initial tension or natural tension as the yarns in the loom or on the spinning frames. Thus the yarns 31 are subjected to exactly the same atmosphere as the warp threads which are being operated on by the textile machinery. It is necessary, therefore, that the yarns 31 shall be assembled first as to the number of the yarn, second as to the number of warp threads in a square inch of the goods, and third, we provide a mechanism which will respond to the contraction and expansion of these proportionate number of threads 31. This controller starts the spray until these yarn threads 31 have absorbed all the moisture they should have before a degree of "wetness" is detected and stop the spray when the full and proper amount of moisture has been absorbed by the yarn ends 31 and the yarn ends on the looms before the yarns become unduly wet.

We have thus provided a complete and unitary controlling mechanism in which yarn ends of

exactly the same character as those being treated by machinery are used for predetermining the amount of moisture required for any specific yarn, or thread or roving. It is to be particularly noted that with this mechanism, the spray head is not cut off immediately upon the rearward movement of the carriage due to a slight contraction of the yarn, but that the water supply valve is kept open until a point of full absorbance has been reached. This point of full absorbance does not mean that the yarn is wet. By this term, we mean that the yarn has fully absorbed that amount of moisture which is necessary for the treatment of that specific yarn.

While we have illustrated certain details of construction and particular arrangement of parts, we do not wish to be limited to these details except as defined in the appended claims, and particularly we do not wish to be limited to the particular form of water controlling valve used nor to the particular form of spray head used.

What is claimed is:—

1. A humidifier control mechanism for textile mills including means for clamping one end of a plurality of separate, parallel textile strands having the same character as the strands of the fabric being operated on in the mill, means at this end for adjustably controlling the tension of said strands, a slidably movable member to which the other ends of the textile strands are operatively connected, a means urging said member away from the textile strands, a spray head or atomizer, a water supply therefor, a valve controlling the water supply to the atomizer, and means operated by a movement of the member upon an expansion of the textile strands acting to open said valve and upon a predetermined contraction of the textile strands acting to close said valve.

2. A humidifier controlling mechanism of the character described, comprising a base, a clamp at one end of said base, adjustable means for retracting said clamp, a slide mounted for rectilinear movement at the other end of said base, means urging the slide away from the clamping means, a rod connected to the slide and moving therewith, a plurality of textile strands having the same character as the textile strands being operated on in proximity to said controlling means, the like ends of the strands being engaged by said clamping means, a comb through which the other ends of the strands pass, means connecting the strands to said rod, a humidifying mechanism valve controlling the supply of water to humidifying mechanism, and means operating upon a predetermined elongation of the strands and a predetermined movement of the slide away from the strands to open said valve.

3. A humidifier controlling mechanism of the character described, comprising a base, a clamp at one end of said base, adjustable means for retracting said clamp, a slide mounted for rectilinear movement at the other end of said base, means urging the slide away from the clamping means, a rod connected to the slide and moving therewith, a plurality of textile strands having the same character as the textile strands being operated on in proximity to said controlling means, the like ends of the strands being engaged by said clamping means, a comb through which the other ends of the strands pass, means connecting the strands to said rod, a humidifying mechanism means controlling the discharge of moisture from the humidifying mechanism, and means operating upon a predetermined elongation of the strands and a predetermined movement of the slide away from the strands to cause the controlling means to discharge moisture, said means acting to operate the humidifier controlling means to cut off the discharge of moisture from the humidifier mechanism upon a predetermined contraction of the strands and a corresponding movement of the slide.

4. A humidifier controlling mechanism including a base, a clamp mounted upon one end of the base, means for retracting or advancing the clamp, a slide mounted upon the other end of the base for rectilinear movement toward or from the clamp, means urging the slide away from the clamp, a rod extending from the slide toward the clamp, a plurality of textile strands engaged at one end by said clamp, a comb through which the strands pass, the strands being twisted beyond the comb and operatively engaged with said rod, a dial having a pointer operatively engaged with the rod to indicate the movement of the rod and slide as the strands are placed under tension and contract or expand, a humidifying mechanism, a valve controlling the supply of water thereto, and means actuated by a predetermined movement of the slide in a direction away from the clamp due to the elongation of the textile strands acting to open said valve upon a predetermined movement of the slide and acting to close said valve upon a predetermined reverse movement of the slide.

5. An apparatus of the character described, including a base, a clamp mounted upon one end of the base, manually adjustable means for retracting said clamp, a slide mounted upon the other end of the base for rectilinear movement toward or from the clamp, springs urging said slide away from the clamp, a rod extending from the slide toward the clamp, a plurality of textile strands engaged at one end by said clamp, a comb through which the strands pass, the strands being twisted beyond the comb and operatively engaged with the rod, a humidifying mechanism, an electrically actuated means for controlling the discharge of moisture from the humidifying mechanism, a contact carried by the slide and electrically connected to the operating mechanism for the humidifier controlling means, said operating mechanism being connected at one side to a source of current, and a second contact mounted in the path of movement of the first named contact and adjustable toward or from the first named contact and electrically connected to the source of current.

6. An apparatus of the character described, including a base, a clamp mounted upon one end of the base, manually adjustable means for retracting said clamp, a slide mounted upon the other end of the base for rectilinear movement toward or from the clamp, springs urging said slide away from the clamp, a rod extending from the slide toward the clamp, a plurality of textile strands engaged at one end by said clamp, a comb through which the strands pass, the strands being twisted beyond the comb and operatively engaged with the rod, a humidifier, an electrically actuated means for controlling the discharge of moisture from the humidifier, a contact carried by the slide and electrically connected to one side of the humidifier controlling means, a cylinder adjustable toward or from the first named contact, a contact carried within the cylinder and having limited movement therein, a spring projecting the contact from the cylinder toward the first named contact, means permitting rectilinear

movement of the contact within the cylinder, the second named contact being electrically connected to a line wire and the other side of said electrical valve actuating means being connected to said line wire.

7. An apparatus of the character described, including a base, a clamp mounted upon one end of the base, manually adjustable means for retracting said clamp, a slide mounted upon the other end of the base for rectilinear movement toward or from the clamp, springs urging said slide away from the clamp, a rod extending from the slide toward the clamp, a plurality of textile strands engaged at one end by said clamp, a comb through which the strands pass, the strands being twisted beyond the comb and operatively engaged with the rod, a humidifier, an electrically actuated means for controlling the discharge of moisture from the humidifier, a contact carried by the slide and electrically connected to one side of the said humidifier controlling means, a cylinder adjustable toward or from the first named contact, a contact carried within the cylinder and having limited movement therein, a spring projecting the contact from the cylinder toward the first named contact, means permitting rectilinear movement of the contact within the cylinder, the second named contact being electrically connected to a line wire and the other side of said electrical humidifier controlling means being connected to said line wire, a dial rigidly mounted with relation to the cylinder, and a pointer carried by the cylinder and coacting with said dial to indicate the adjustment of the cylinder longitudinally toward or from the first named contact.

8. A humidifier controlling mechanism including a base, a clamp mounted upon one end of the base, a slide mounted upon the other end of the base, springs urging said slide away from the clamp, a rod connected to the slide, a series of textile strands engaged by said clamp, a comb through which the textile strands pass, the strands beyond said comb being twisted and being positively connected to the rod, means for manually adjusting the clamp toward or from the comb, means for indicating the amount of tension under which the strands are placed, a humidifier, a means controlling the discharge of moisture therefrom, electrically actuated means for said means, a contact carried by the slide, a second contact with which the first named contact engages when the slide moves away from the said clamp upon an expansion of the strands, said contacts being connected in circuit with a source of power and the humidifier controlling means, and a perforated cover disposed over the base and enclosing said mechanism.

9. A humidifier controlling mechanism including a base, a clamp mounted upon one end of the base, a slide mounted upon the base, means urging said slide away from the clamp, a rod connected to the slide, a series of textile strands disposed in a single plane and engaged by said clamp, a comb through which the strands pass, the strands beyond said comb being twisted and being positively connected to the rod, means for manually adjusting the clamp toward or from the comb to initially tension the strands, means for indicating the amount of tension under which the strands are placed, a humidifier controlling element carried by the slide, a second humidifier controlling element with which the first named element engages when the slide moves away from said clamp upon an expansion of the strands, and means keeping said controlling elements in engagement with each other for a predetermined portion of the movement of the slide toward the clamping means.

10. A humidifier controlling mechanism including a base, a clamp mounted upon one end of the base, a slide mounted upon the base, means urging said slide away from the clamp, a rod connected to the slide, a series of textile strands disposed in a single plane and engaged by said clamp, a comb through which the strands pass, the strands beyond said comb being twisted and being positively connected to the rod, means for manually adjusting the clamp toward or from the comb to initially tension the strands, means for indicating the amount of tension under which the strands are placed, a humidifier controlling element carried by the slide, a second humidifier controlling element with which the first named element engages when the slide moves away from said clamp upon an expansion of the strands, means keeping said humidifier controlling elements in engagement with each other for a predetermined portion of the movement of the slide toward the clamping means, a casing enclosing the base and the parts mounted thereon, and a partition extending entirely across the casing and through which the twisted portions of the strands pass, the portion of the casing above the untwisted portions of the strands being perforated.

11. An apparatus of the character described, including a base, a clamp mounted upon one end of the base, manually adjustable means for retracting said clamp, a slide mounted for rectilinear movement toward or from the clamp, means urging said slide away from the clamp, a plurality of textile strands disposed in a single plane and engaged at one end by said clamp, a comb through which the strands pass, the strands beyond the comb being twisted and operatively engaged with the slide, electrically operated means for controlling the discharge of moisture from a humidifier, a controlling element for said electrically operated means movable with the slide, a rigid support, a cylinder adjustably carried by the support in line with the first named controlling element, a second controlling element for said electrically operated means and disposed within the cylinder, a spring urging the second controlling element toward the first named controlling element, and means on the cylinder limiting the movement of the controlling element therein in a direction toward the first named controlling element.

12. An apparatus of the character described, including a base, a clamp mounted upon one end of the base, manually adjustable means for retracting the clamp, a slide mounted for rectilinear movement toward or from the clamp, means urging said slide away from the clamp, a plurality of textile strands engaged at one end by said clamp, the strands being disposed in a single plane, a comb through which the strands pass, the strands after passing through the comb being operatively engaged with the slide, a humidifier, an air actuated valve controlling the humidifier, an air vent pipe operatively connected to the valve actuating means and having a port, a plug movable with the slide and normally closing the vent port, a longitudinally adjustable element carrying the air vent pipe, a spring urging the air vent pipe toward the plug, and means on the cylinder limiting the movement of the air vent pipe toward the plug.

13. In a mechanism of the character described, a humidifier and a main controlling means therefor, including a clamp, a plurality of strands disposed in said clamp and extending in a single plane, a slide to which said strands are operatively connected, means urging said slide in a direction away from the clamp, a humidifier controlling element mounted on the slide, a second humidifier controlling element coacting with the first named element, the two elements when in contact with each other causing the operation of the humidifier and when separated from each other stopping the operation of the humidifier, and means keeping said controlling elements in engagement with each other for a predetermined portion of the movement of said slide toward the clamping means before said elements separate.

14. A humidifier controlling mechanism for textile mills, including two electrically engageable contacts, one movable with relation to the other, the movable contact having electrical engagement with the other contact during a certain extent of movement, but upon a predetermined greater extent of movement breaking said engagement; a plurality of parallel separate textile strands; means clamping the like ends of the strands; means operatively engaging the other ends of the strands with said movable contact to thereby cause its movement in a direction to separate the contacts as the strands contract by the absorption of moisture; and means keeping the strands under tension and urging the movable contact in a direction to keep it in engagement with the other contact.

15. A humidifier controlling mechanism for textile mills, including two electrically engageable contacts, one movable with relation to the other, the movable contact having electrical engagement with the other contact during a certain extent of movement, but upon a predetermined greater extent of movement breaking said engagement; a plurality of parallel separate textile strands; means clamping the like ends of the strands; means operatively engaging the other ends of the strands with said movable contact to thereby cause its movement in a direction to separate the contacts as the strands contract by the absorption of moisture; means keeping the strands under tension and urging the movable contact in a direction to keep it in engagement with the other contact; and means causing the contacts to remain in engagement with each other until just before the point of full absorption of moisture by the strands has been reached.

16. A humidifier controlling mechanism for textile mills, including two electrically engageable contacts one movable with relation to the other, the other contact being adjustable parallel to the path of movement of the first named contact and having means whereby it may be held in its adjusted position, the movable contact having electrical engagement with the other contact during a certain extent of movement but upon a predetermined greater extent of movement breaking said engagement; a plurality of parallel separate textile strands; means clamping the like ends of the strands; means operatively engaging the other ends of the strands with said first named movable contact to thereby cause its movement in a direction to separate the adjustable contact and the movable contact as the strands contract by absorption of moisture; and means keeping the strands under tension and urging the movable contact in a direction to keep it in engagement with the other contact, the contacts being so constructed and arranged as to remain in electrical engagement with each other until just before the point of full absorption of moisture by the strands has been reached.

17. A humidifier control mechanism for textile mills, including means for clamping one end of a plurality of separate parallel textile strands; means for tensioning the textile strands; a slidably movable member to which the other ends of the textile strands are operatively connected; means urging said member away from the textile strands, humidifying mechanism, means controlling the discharge of moisture from the humidifying mechanism; and means operated by a movement of the member upon an expansion of the textile strands due to evaporation of moisture therefrom acting to operate said humidifying means to discharge more moisture into the air and upon a predetermined contraction of the strands acting to operate said humidifying means to decrease or cut off the discharge of moisture.

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