July 30, 1957 W. P. POPE 2,800,724

SETTING APPARATUS FOR TEXTILE FABRICS

Filed Jan. 7, 1955 2 Sheets-Sheet 1

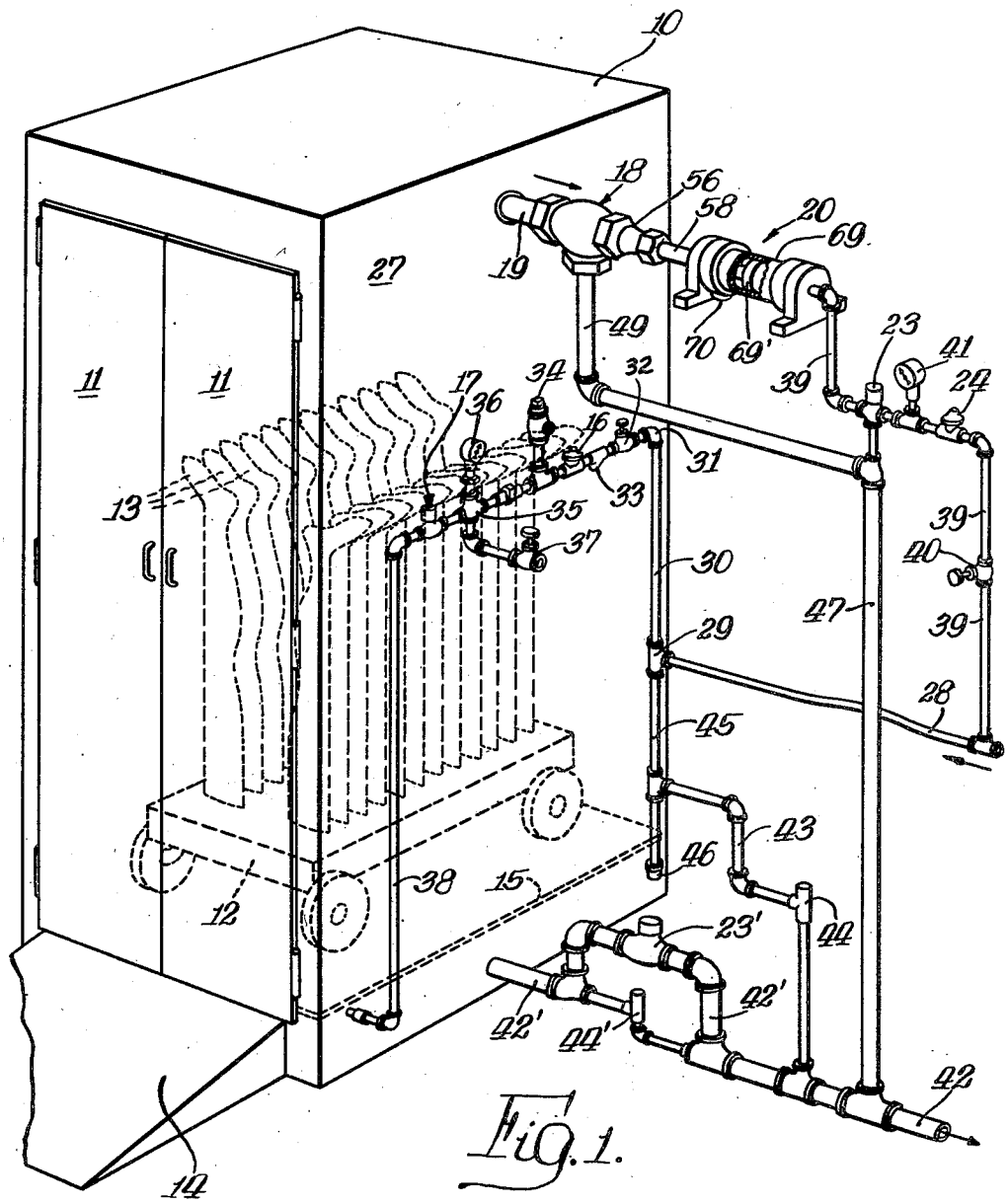

Fig. 1.

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Fig. 2.

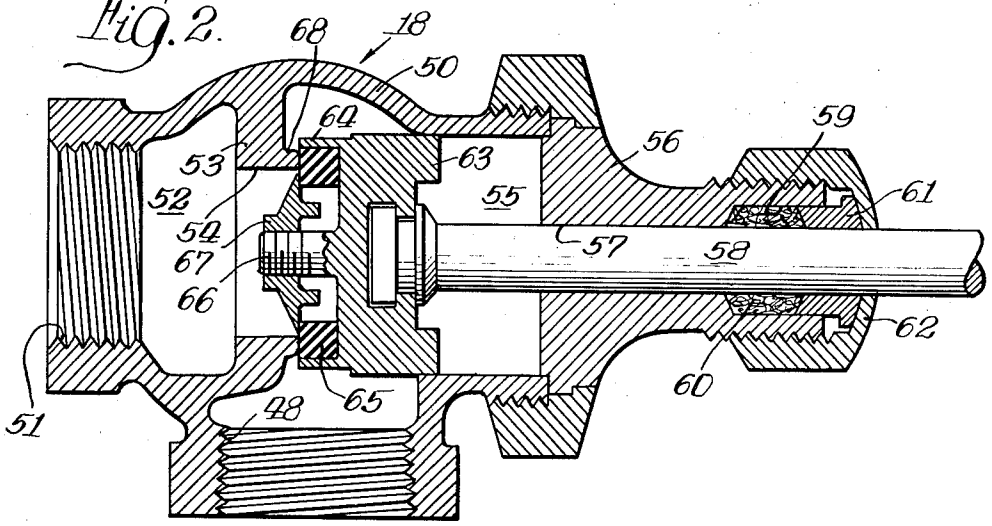
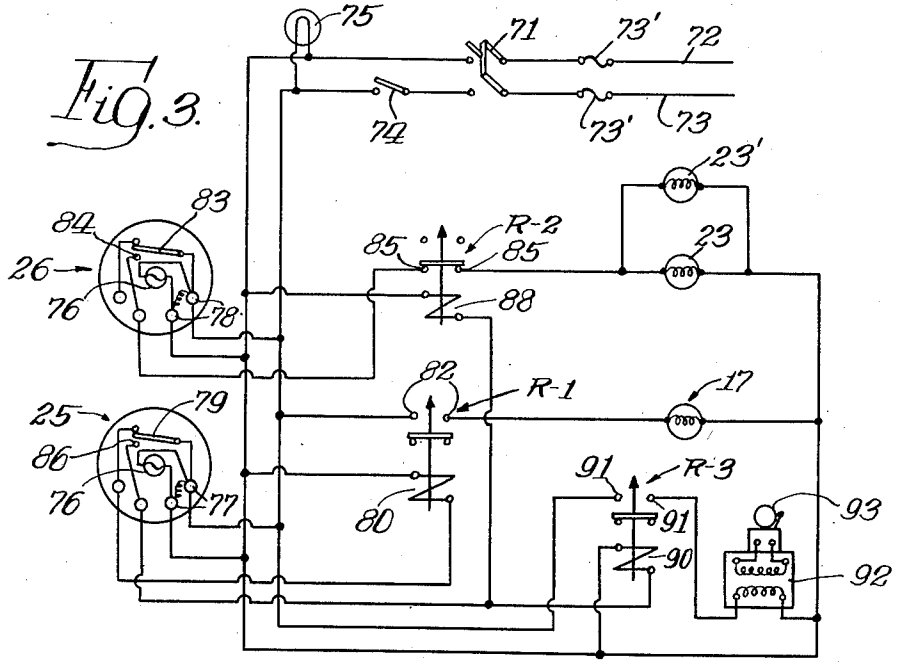


Fig. 3.



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SETTING APPARATUS FOR TEXTILE FABRICS

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12 Claims. (Cl. 34—48)

The present invention relates to improvements in setting apparatus for textile fabrics and more particularly to an improved vessel or pressure retort device within which knitted textile articles, such as stockings and other items knitted of nylon and the like, may be set on forms of the desired shape in the presence of steam for the purpose of reducing the resiliency of the knitted loops and removing the natural krinkles from the loose fabric, thereby causing the articles to retain the shapes of the forms during subsequent use.

Setting operations of this kind are usually conducted on the articles in batches and normally are carried on, particularly when nylon fabrics are involved, in a pressure atmosphere of saturated steam at a temperature of from about 240° Fahrenheit to about 260° Fahrenheit. Although the particular treatment temperature selected within (or near) this range is not necessarily critical, it has been found that uniformity of treating temperature and atmosphere is quite important in attaining uniformity in the finished articles. It has been found among other things, for example, that substantial variations in temperature and atmosphere during the setting of a batch of articles will cause variations in the finished results, and variations in the temperatures and atmospheres to which two different batches of articles are subjected during the setting treatment will often cause noticeable differences in the dye shades between the two batches of otherwise identical items.

Prior efforts directed toward providing close temperature and atmospheric control in fabric setting apparatus of the kind referred to for the most part have proceeded on a theory of temperature control through the use of delicate on and off type electrical thermostats that act in response to temperature changes to cause the steam to be turned off and on. These efforts have not been entirely satisfactory, however, due to several factors. In the first place, such thermostats have inherent under-ride and over-ride characteristics which, even with high grade instruments, may result in an actual fluctuation of temperatures as great as two degrees above or below the desired constant temperature. This fluctuation or variation in temperature is, in itself, sufficient to cause differences in the dye shades of nylon hosiery. Furthermore, efforts to reduce the magnitude of the under-ride and over-ride characteristics in thermostats have merely resulted in making the instruments even more delicate and more fragile and expensive, and have generally resulted in requiring more frequent recalibration and maintenance, which is highly undesirable in the field.

The present invention serves to overcome and avoid the above mentioned difficulties and has as one of its principal objects the provision, in combination with a pressure type textile setting retort, of a simplified, relatively inexpensive system for obtaining and very accurately maintaining a predetermined steam atmospheric condition within the retort, the same predetermined atmospheric condition being reproduced with a very high degree of accuracy every time the retort is operated to treat successive batches of fabric articles, thereby producing a higher degree of uniformity in the finished items than has heretofore been feasible. Another object of the invention is to provide, in a textile setting retort of the kind just stated, a treating atmosphere control system wherein the addition of further steam into the treating chamber during the course of actual treatment of the fabric articles therein, is controlled by pressure sensitive balancing means which avoids entirely the use of thermostatic switches and the troublesome inaccuracies inherent therein. Yet another object of the invention is to provide in the control system means for maintaining a predetermined pressure differential between the pressure within the retort and a known predetermined reference pressure, while at the same time accommodating, if desired, a continuous flow of steam into and out of the vessel, thereby maintaining a constant treating atmosphere within the vessel or retort.

The invention furthermore involves the discovery that more satisfactory results may be obtained in the setting of fabric articles in steam retorts if, at the beginning of the treatment of a batch of articles, the air within the retort is quickly expelled and the pressure and temperature of the treating steam atmosphere is very quickly brought up to the desired constant levels. Thus, the present invention has as another of its objects the provision of automatic control means acting to cause the rapid admission of steam into the retort, quickly to flush the air therefrom when a treating cycle is first begun, and means thereafter automatically operative to cause the desired treating atmosphere to be attained without delay and to be maintained at a predetermined constant for a predetermined length of time, whereupon the treating cycle is automatically brought to an end.

These and other objects and advantages of the present invention will be apparent from the following description of a preferred embodiment thereof, taken with the accompanying drawings, wherein:

Fig. 1 is a diagrammatic illustration of one form of the textile setting apparatus of the present invention, the particular treating chamber shown being merely representative of any suitable pressure retort within which fabric articles may be placed on forms for the setting treatment;

Fig. 2 is an elevational view, in vertical section, taken through an exhaust pressure throttling valve employed in the pressure control system in the apparatus shown in Fig. 1, and;

Fig. 3 is a diagrammatic view of the electric circuit employed in the control system.

Referring to the drawings, the textile treating apparatus there illustrated and embodying the features of the present invention includes a pressure retort **10** provided at its front end with a door opening and a suitable steam-tight closure therefor. As indicated above, the retort **10** may be of any appropriate structure adapted, within the usual rules of safety, to withstand an internal steam pressure of considerable value. The door or doors for closing the door-way of the retort may likewise be of any suitable structure, a pair of doors **11** being illustrated for that purpose in Fig. 1. The door or doors for the opening in the retort are, of course, provided with latching and bolting means (not shown) constructed in accordance with well known practice so as to withstand the internal pressures to which the retort is subjected. The doorway may be of any desired size sufficient to permit the introduction into the retort of the textile articles to be set. For purposes of illustration, the doorway shown in Fig. 1 is of relatively large size so as to permit a cart **12**, carrying a plurality of hosiery forms **13**, to be rolled up a ramp **14** and into the retort where the cart is shown resting upon an elevated inner floor **15** of the retort, the forms **13** being adapted to carry thereon hosiery to be set within the retort. However, neither the particular

doorway illustrated nor the cart are a part of the present invention, it being understood that any suitable retort chamber and means for introducing articles therein to be set, such for example as those shown in U. S. Letters Patent Nos. 2,520,062 and 2,689,071, may be employed.

Broadly speaking, steam is led to the retort from an ordinary boiler or other steam pressure source, first through an adjustable pressure regulator **16** and thence to one side of a solenoid controlled inlet valve **17**, the other side of which is connected to an inlet port located in the right-hand cabinet wall below the level of the floor **15**. While the retort is in operation the inlet valve **17** remains open and a predetermined steam pressure and temperature is maintained in the retort **10** by means of pressure responsive controls including a throttling valve **18** that is operatively associated with an exhaust conduit **19** connected to an exhaust port located in an upper portion of the right-hand cabinet wall. The throttling valve is controlled by a piston and cylinder device **20** which is controlled, in turn, by a solenoid operated control valve **23**. This control valve is operative for alternately connecting the cylinder to drain, or to the source of steam through an adjustable pressure regulator **24**. The throttling valve **18**, as will be explained in greater detail later, is provided with a movable valve member that is capable of occupying full open and closed positions and any intermediate position therebetween to govern the rate at which steam is exhausted through the pipe **19** and its related fittings, all of which constitute an exhaust passageway. The construction and arrangement of the valve member within the throttling valve is such that the pressure of the steam within the retort creates a force upon the valve member urging it toward the open position, while the cylinder device **20**, when in action, exerts a predetermined force in the opposite direction on the valve member urging it toward closed position. Thus, at any particular moment while the cylinder device **20** is in operation and while there is steam under pressure within the retort, the relative position of the valve member, and the consequent rate at which steam will be exhausted through the pipe **19**, is controlled by the difference between the force exerted by the steam upon the valve member and the predetermined force exerted upon the valve member by the cylinder device **20**.

The retort is also provided with a second exhaust and drain passageway which comprises a conduit **42'** extending from the lower interior of the retort, beneath the floor **15**, to a main exhaust line **42** through a normally open, solenoid operated, exhaust valve **23'** which is operative as subsequently described.

A control system is provided for the valves **17**, **23** and **23'**, including a treatment timer **25** (Fig. 3) and a delay timer **26** (Fig. 3) which control the valves for automatically operating the treating cabinet through a complete cycle of operation. Broadly speaking, the cycle of operation comprises a preliminary heating and flushing period, followed by a treatment period wherein a predetermined steam atmosphere is maintained for a predetermined interval. The shutting of the doors **11** closes an electric circuit which immediately activates the treatment and delay timers **25** and **26** and simultaneously opens the normally closed inlet valve **17** to introduce steam into the retort in contact with the articles therein. The throttling valve **18** and the exhaust valve **23'** remain open and inactive during the preliminary period to permit incoming steam very quickly to displace the air in the retort and flush the same out through the exhaust conduits **19** and **42'**. After a suitable predetermined period, during which time the interior of the retort is heated and the air therein is driven out, the delay timer times out and causes the valve **23'** to be closed to shut off the discharge of steam through the exhaust conduit or passageway **42'**. Simultaneously with the closing of the valve **23'**, the delay timer **26** also causes operation of the control valve **23** to connect the cylinder device **20** to the source of steam pressure, whereupon the predetermined force mentioned above is immediately applied by the cylinder device to the valve member in the throttling valve **18**, urging the valve member toward its closed position. Inasmuch as the internal pressure in the retort at this time will be at or only slightly above atmospheric pressure, the valve member in the throttling valve will at once be seated in closed position and will remain closed until the incoming steam will have built up the pressure within the retort to a predetermined desired value. This desired value may be only that which will begin to lift or move the valve member in the throttling valve off its seat or, preferably, it may be such as will hold the valve member slightly off of its seat, thereby permitting a continuous flow of steam through the retort while at the same time maintaining the pressure within the retort at a desired constant, the temperature of the steam within the retort, of course, being a direct function of the pressure. After a further predetermined period, during which setting of the articles in the retort takes place, the cycle of operation is automatically brought to an end by the timing out of the treatment timer **25** which simultaneously causes the steam inlet valve **17** to be closed to cut off the steam supplied to the interior of the retort and to cause opening of the valve **23'** and operation of the valve **23**. Opening of the valve **23'** again permits the exhaustion of steam through the exhaust passageway or conduit **42'** and the operation of the valve **23** shuts off the steam supply to the cylinder device **20** and vents the cylinder to the exhaust line **42**, thereby immediately relieving the force urging the valve member of the throttling valve **18** toward its closed position and permitting the residual pressure in the retort to move the valve member to its full open position, whereupon the steam within the retort is exhausted through the conduit **19** as well as through the passageway or conduit **42'**.

It will be seen more fully, as the description proceeds, that the presence of the two exhaust passageways in the apparatus permits very rapid displacement of the air from the retort at the initiation of the operating cycle and thereby reduces the time that expires before the interior of the retort is brought to its treating condition. This produces better quality in the articles being set and at the same time has the advantage of shortening the overall time required to complete one cycle of operation.

Referring now in greater detail to the drawings, the retort **10** there illustrated comprises a box-like casing including a right-hand side wall **27** through which the steam inlet and exhaust conduits extend as previously described. It is contemplated that the retort may comprise any suitable and properly insulated structure adapted for use under normal operating pressures of about 17 to 20 p. s. i. and provided with adequate latch and sealing means cooperating with the doors **11**. The floor **15** may also be arranged in any suitable manner so as to permit flow of inlet steam into the upper portion of the retort interior.

As best shown in Fig. 1, the general piping arrangement comprises an inlet line **28** connected at its right-hand end to any suitable pressure steam source such as a boiler for producing quality controlled saturated steam. The line **28** communicates at its left-hand end through a T fitting **29** and with a line **30** which extends vertically adjacent the right-hand side wall **27** of the cabinet. Line **30** further communicates through an elbow fitting **31** and with a horizontal plurality of pipe sections communicating, in successive order from the inlet pressure side of the elbow fitting **31**, with a manually operated shut-off valve **32**, a steam trap **33**, the pressure regulator **16**, a poppet valve **34** and a four way fitting **35**. One side of the fitting **35** communicates with a pressure gage **36** and the opposite side communicates with a manually operated relief valve **37**. The remaining side of the fitting **35** communicates with the solenoid operated inlet valve **17** which is connected to an L shaped line **38** extending down-

wardly for communication with the cabinet interior beneath the cabinet floor 15.

The piston and cylinder device 20 is connected to the steam pressure supply line 28 by means of a plurality of pipe sections 39 which interconnect (in successive order from the inlet pressure side of the arrangement) a manually operated shut-off valve 40, the pressure regulator 24, a pressure gage 41 and the three way solenoid operated control valve 23.

The piping arrangement also includes means for carrying off the exhausted steam during operation of the retort, which means include lines for carrying off the exhaust simultaneously from both the upper and lower portions of the cabinet 10 in order to facilitate rapid exhaust of air from the cabinet during the initial flushing and heating period of the cycle and rapid exhaust of steam at termination of each completed cycle of operation, as previously stated. A main exhaust line 42 is connected at its left-hand end to the lower exhaust conduit or passageway 42' and at its right-hand end to the atmosphere or, if desired, to further piping (not shown) which will return the exhaust to the boiler or other steam source. The exhaust conduit 42' is provided with the normally open solenoid operated valve 23', as noted, which is located in by-passing arrangement with respect to a thermostatic condensate trap 44'. Thus, during the flushing period of the cycle, condensate, exhaust steam and air may pass to the main exhaust line through the open valve 23'. After the valve 23' has been closed at the beginning of the treatment period, the trap 44' will continue to operate for draining condensate from the bottom of the retort and to the main exhaust line 42. If desired, condensate may be exhausted from the steam inlet side of the piping arrangement by a line 43 comprising a chain of pipe sections connected at its lower end, through a thermostatic condensate trap 44, to the main exhaust line 42 at a point beyond the outlet side of the valve 23'. The upper end of the line 43 is connected intermediate the lower end of an extension 45 of the line 30, and a cap 46 is provided on the lower end of the extension 45 to aid in draining the system. Further, the piston and cylinder device 20 is connectable to the exhaust by a line 47 communicating at its lower end with the main exhaust line 42 at a point beyond the outlet side of the valve 23', and connected at its upper extremity to one outlet of the control valve 23. Also, as subsequently more fully described, the throttling valve 18 is provided with an exhaust port 48 which is connected to the exhaust line 47 by a line 49.

Referring now to Fig. 2 of the drawings, the throttling valve 20 there illustrated comprises a casing 50 provided at its left-hand end with an internally threaded inlet port 51 threadably received by the exhaust conduit 19. The port 51 communicates with an inlet chamber 52, including an annular member 53 defining a circular opening 54 through which exhaust steam may pass into a valve chamber 55 of the casing when the valve assembly 18 is in an open condition. As previously noted, the casing is further provided with an internally threaded exhaust port 48 communicating between the chamber 55 and the exhaust line 49. The right-hand end of the casing 50 (as viewed in Fig. 2) threadably receives an elongated end cap 56 which is provided with a longitudinal bore 57 for slidably receiving a valve stem 58. The right-hand extremity of the bore 57 includes an enlarged portion 59 for receiving suitable packing 60 that is secured in position by a packing gland 61 and an overlying packing nut 62. The inner end of the valve stem carries a cylindrical valve member 63 that is slidable in the valve chamber 55 and is provided at its seating end with an annular rib 64 which provides a cup for snugly receiving a rubber seating ring 65. An externally threaded extension 66 extends longitudinally from the valve member 63 for receiving a threaded nut 67 that serves to retain the ring 65 in position. The ring 65 is adapted to seat against an annular

seat 68, formed upon the member 53, when the valve member is in the left-hand or closed position, as shown in Fig. 2.

The throttling valve assembly 18 is normally open and inactive, and during the flushing portion of the cycle, it is in a right-hand or fully open position to permit the exhaust of air and steam from the exhaust conduit 19 through the valve inlet port 51, the opening 54 and the valve exhaust port 48, through line 49 and thence to the main exhaust line 42. Upon the timing out of the delay timer 26, however, the piston and cylinder device 20 is connected to the source of steam pressure through the pressure regulator 24 by the control valve 23, and operates to shift the throttling valve member 63 toward its left-hand position. When internal retort pressure has substantially reached a predetermined operating pressure, the valve member 63 will be about to open or will float in a slightly open position to maintain a constant pressure in the retort, while at the same time, if desired, it will permit a substantially continuous flow of steam through the retort.

The piston and cylinder device 20 comprises a cylinder mounted in any suitable way containing a piston 69' connected to the valve stem 58, and may be of any suitable construction adapted to operate under the steam pressure determined by the regulator 24, this pressure being such that the valve member 63 is urged toward a seating position with a force substantially equal to or slightly less than the force exerted by the predetermined desired steam pressure in the retort tending to move the valve member toward its open position. As best shown in Fig. 1, the cylinder 69 is provided at its left-hand end with an air vent 70 and is connected at its right-hand end to the steam pressure source through the control valve 23.

As best shown in Fig. 3, the control system for the apparatus described above includes an electric circuit comprising a main switch 71 for connecting the circuit to a suitable source of electricity through main conductors 72 and 73 and a pair of fuses 73'.

At the beginning of a cycle of operation, hosiery to be treated is placed in the retort 10 (Fig. 1) and the main switch 71 is closed. The doors 11 are then closed and secured, the closing of the doors causing the closing of a door operated switch 74 which completes a circuit through a signal lamp 75, to indicate that the treating cabinet is in operation, and also completes circuits to the treatment and delay timers 25 and 26, respectively, through their respective terminals 77 and 78 to energize their rotors 76. The closing of the door switch 74 also establishes a circuit through the treatment timer switch arm 79 to energize a solenoid 80 of a normally open relay R–1, thereby closing contacts 82 of the relay. Closing of the contacts 82 of the relay R–1 energizes the solenoid of the inlet valve 17 to open the valve and permit steam under pressure, predetermined in value by pressure regulator 16, to enter at a rapid rate into the interior of the cabinet and into contact with the articles therein to begin the heating and flushing period of the cycle. During this initial period, air in the cabinet is flushed rapidly through the open and inactive throttling valve assembly 18, and through the exhaust lines 49 and 47 into the main exhaust line 42. Also, air is exhausted rapidly through the lower exhaust conduit 42' and through the normally open valve 23' into and through the main exhaust line 42. In addition, condensate which is formed in the retort as it is rapidly brought up to temperature, is drained from the bottom of the retort through the lower exhaust conduit and the condensate trap 44' and into the main exhaust line 42.

The heating and flushing period continues until the delay timer 26 times out, whereupon a switch arm 83 therein drops down and completes a circuit through the delay timer contact 84 and the contacts 85 of a normally closed relay R–2 simultaneously to energize the solenoid

of the control valve 23 and the solenoid of the normally open exhaust vave 23' connected in parallel therewith. Energizing of the solenoid of the control valve 23 operates to shift the valve from a normal position for connecting the piston and cylinder device 20 to drain and into a position wherein the piston and cylinder device 20 is connected to the steam pressure line 28 through the pressure regulator 24 for activating the throttling valve assembly 18 to begin the treating period of the cycle, as previously explained. Energizing of the solenoid of exhaust valve 23' operates to shift the valve from a normally open position into a closed position to stop the flow of steam through the lower exhaust conduit and permit rapid increase in the steam pressure in the retort. As regulator 24 is preset at a pressure such that valve member 63 is urged toward a closed position under a pressure less than desired internal operating cabinet pressure, the valve member 63 will remain in a seating position only momentarily until the internal retort operating pressure builds up and forces the valve member 63 into an open position. Thereafter, the valve member operates under the force differential and floats in an open position responsive to exhaust pressure for maintaining substantially constant operating pressure in the cabinet while, if desired, accommodating a substantially continuous flow of steam from the inlet port through the exhaust system.

At the end of a cycle of operation, the treatment timer times out to terminate the treatment period and the switch arm 79 thereof drops into a lower position to interrupt the energizing circuit of relay R–1, whereupon the armature of that relay drops and interrupts the circuit to the inlet valve 17 which thereupon closes and shuts off the steam flow into the retort. At the same instant, a circuit is completed through switch arm 79 and a cooperating contact 86, to the solenoid 88 of the relay R–2 and to a solenoid 90 of a relay R–3, which solenoids are connected in parallel. Energizing of the solenoid 88 of the relay R–2 opens the normally closed contacts 85 of the relay, thereby interrupting the circuit to the control valve 23 and the main exhaust valve 23'. The exhaust valve 23' then shifts into its normally open position for connecting the lower exhaust conduit 42' to the main exhaust line. At the same instant, the control valve 23 shifts into its normally closed position to shut off the supply of steam to the piston and cylinder device 20 and to connect the cylinder to the main exhaust line 42. Residual steam pressure in the retort immediately shifts the throttling valve member 63 into a fully open position which permits the steam in the cabinet to be quickly exhausted through the main exhaust line 42. Energizing of the solenoid 90 closes the normally open relay R–3 and a circuit is thereupon completed through contacts 91 thereof to the primary side of a transformer 92, the secondary side of which is connected to a bell or buzzer 93 which gives an audible signal indicating to the operator that the cycle of operation has been completed. The operator thereupon opens the doors of the cabinet. This action opens the door switch 74 which interrupts the flow of current to the entire circuit.

When the contents of the cabinet have been removed, the operator resets the delay timer and the treatment timer to cause their respective switch arms to be raised to their upper positions. When this has been done another automatic cycle of operation, for successively maintaining substantially the same controlled environment in the treating cabinet, will be initiated by closing the doors of the cabinet, with the consequent closing of the door switch.

In view of the foregoing description, it will be understood that the textile treating apparatus of the invention is operative for maintaining a substantially uniform controlled environment in the retort throughout the treating period of the operating cycle. Also, the apparatus is operative for maintaining and reproducing substantially the same controlled environment during successive operations of the retort, wherein desired temperature is maintained substantially constant through the use of accurate pressure sensitive controls that are not subject to the inherent under-ride and over-ride characteristics of electric thermostatic controls. Moreover, the arrangement is such that the environment is not controlled through an on and off type steam inlet or exhaust valve operating in response to predetermined maximum or minimum conditions depending upon pressure or temperature variation in the environment. Thus, the arrangement of the control system of the invention, which permits a substantially continuous flow of steam between the retort inlet and exhaust means during the operating cycle of the treating cabinet, provides substantially instantaneous pressure control over the steam atmosphere in the retort without depending upon the on and off action of an inlet or exhaust valve.

While there has been described one embodiment of the invention, it will be understood that various modifications may be made therein, and it is intended to cover in the appended claims all such modifications as fall within the true spirit and scope of the invention.

I claim:

1. In textile setting apparatus of the class described, including a pressure-tight retort having a door opening through which fabric articles may be introduced into the interior of said retort and a door for closing said opening, the combination comprising means for introducing steam under pressure into the interior of said retort in contact with said articles, an exhaust passageway leading from the interior of said retort to the exterior thereof, a freely movable valve member in said passageway for governing the rate of flow of exhaust steam through said passageway for maintaining constant pressure in said retort, said valve member being movable between full open and closed positions and to a plurality of positions intermediate thereof and being so constructed and arranged that force exerted by the pressure of said steam in said retort is directed against said valve member in a direction urging said valve member toward said full open position, and fluid pressure operated means for applying a predetermined constant force upon said valve member in the opposite direction to urge said valve member toward said full closed position, the relative position of said valve member and the consequent rate of flow of said exhaust steam through said passageway at any given moment being responsive to the difference in value at that moment between said first mentioned force and said predetermined constant force.

2. In textile setting apparatus of the class described, including a pressure-tight retort having a door opening through which fabric articles may be introduced into the interior of said retort and a door for closing said opening, the combination comprising means for introducing steam under pressure into the interior of said retort in contact with said articles, an exhaust passageway leading from the interior of said retort to the exterior thereof, a freely movable valve member in said passageway for governing the rate of flow of exhaust steam through said passageway for maintaining constant pressure in said retort, said valve member being movable between full open and closed positions and to a plurality of positions intermediate thereof and being so constructed and arranged that force exerted by the pressure of said steam in said retort is directed against said valve member in a direction urging said valve member toward said full open position, a movable piston operatively connected to said valve member, and means for supplying a predetermined constant fluid pressure to said piston to move the same and apply a predetermined constant force upon said valve member urging said valve member toward its full closed position, the relative position of said valve member and the consequent rate of flow of said exhaust steam through said passageway at any given moment being responsive to the

difference in value at that moment between said first mentioned force and said predetermined constant force.

3. In textile setting apparatus of the class described, including a pressure-tight retort having a door opening through which fabric articles may be introduced into the interior of said retort and a door for closing said opening, the combination comprising means for introducing steam under pressure from a steam source into the interior of said retort in contact with said articles, an exhaust passageway leading from the interior of said retort to the exterior thereof, a freely movable valve member in said passageway for governing the rate of flow of exhaust steam through said passageway for maintaining constant pressure in said retort, said valve member being movable between full open and closed positions and to a plurality of positions intermediate thereof and being so constructed and arranged that force exerted by the pressure of said steam in said retort is directed against said valve member in a direction urging said valve member toward said full open position, a cylinder having a piston therein operatively connected to said valve member and means for admitting steam at a predetermined constant pressure from said steam source into said cylinder to move said piston and thereby apply a predetermined constant force upon said valve member urging said valve member toward its full closed position, the relative position of said valve member and the consequent rate of flow of said exhaust steam through said passageway at any given moment being responsive to the difference in value at that moment between said first mentioned force and said predetermined constant force.

4. In textile setting apparatus of the class described, including a pressure-tight retort having a door opening through which fabric articles may be introduced into the interior of said retort and a door for closing said opening, the combination comprising means for introducing steam under pressure into the interior of said retort in contact with said articles, an exhaust passageway leading from the interior of said retort to the exterior thereof, a freely movable valve member in said passageway for governing the rate of flow of exhaust steam through said passageway for maintaining constant pressure in said retort, said valve member being movable between full open and closed positions and to a plurality of positions intermediate thereof and being so constructed and arranged that force exerted by the pressure of said steam in said retort is directed against said valve member in a direction urging said valve member toward said full open position, fluid pressure operated means for applying a predetermined force upon said valve member in the opposite direction to urge said valve member toward said full closed position, means for starting the operation of said steam introducing means to flood the interior of said retort with the vapors of said steam, and means automatically actuated a predetermined time interval after the starting of said steam introducing means for starting the operation of said fluid pressure operated means, said valve member permitting free discharge of displaced air from the interior of said retort during said predetermined time interval.

5. The combination set forth in claim 4 wherein said means for starting the operation of said steam introducing means is actuated by the closing of said door.

6. In textile setting apparatus of the class described, including a pressure-tight retort having a door opening through which fabric articles may be introduced into the interior of said retort and a door for closing said opening, the combination comprising means for introducing steam under pressure into the interior of said retort in contact with said articles, an exhaust passageway leading from the interior of said retort to the exterior thereof, a freely movable valve member in said passageway for governing the rate of flow of exhaust steam through said passageway for maintaining constant pressure in said retort, said valve member being movable between full open and closed positions and to a plurality of positions intermediate thereof and being so constructed and arranged that force exerted by the pressure of said steam in said retort is directed against said valve member in a direction urging said valve member toward said full open position, fluid pressure operated means for applying a predetermined force upon said valve member in the opposite direction to urge said valve member toward said full closed position, means for starting the operation of said steam introducing means to flood the interior of said retort with the vapors of said steam, means automatically actuated a first predetermined time interval after the starting of said steam introducing means for starting the operation of said fluid pressure operated means, and means automatically actuated a second predetermined time interval after the starting of said steam introducing means for stopping the operation of said steam introducing means and said fluid pressure operated means.

7. In textile setting apparatus of the class described, including a pressure-tight retort having a door opening through which fabric articles may be introduced into the interior of said retort and a door for closing said opening, the combination comprising means for introducing steam under pressure into the interior of said retort in contact with said articles, an exhaust passageway leading from the interior of said retort to the exterior thereof, a freely movable valve member in said passageway for governing the rate of flow of exhaust steam through said passageway for maintaining constant pressure in said retort, said valve member being movable between full open and closed positions and to a plurality of positions intermediate thereof and being so constructed and arranged that force exerted by the pressure of said steam in said retort is directed against said valve member in a direction urging said valve member toward said full open position, a cylinder having a piston therein operatively connected to said valve member, means for introducing fluid at a predetermined pressure into said cylinder to move said piston and thereby apply a predetermined force upon said valve member urging said valve member toward its full closed position, means for starting the operation of said steam introducing means to flood the interior of said retort with the vapors of said steam, means automatically actuated a first predetermined time interval after the starting of said steam introducing means for starting the operation of said fluid introducing means, and means automatically actuated a second predetermined time interval after the starting of said steam introducing means for stopping the operation of said steam introducing means and for exhausting said fluid pressure from said cylinder, thereby permitting free movement of said valve member to its full open position and permitting exhaustion of said steam from the interior of said retort.

8. In textile setting apparatus of the class described, including a pressure-tight retort having a door opening through which fabric articles may be introduced into the interior of said retort and a door for closing said opening, the combination comprising means for introducing steam under pressure into the interior of said retort in contact with said articles, an exhaust passageway leading from the interior of said retort to the exterior thereof, a freely movable valve member in said passageway for governing the rate of flow of exhaust steam through said passageway for maintaining constant pressure in said retort, said valve member being movable between full open and closed positions and to a plurality of positions intermediate thereof and being so constructed and arranged that force exerted by the pressure of said steam in said retort is directed against said valve member in a direction urging said valve member toward said full open position, a cylinder having a piston therein operatively connected to said valve member, means for introducing fluid at a predetermined constant pressure into said cylinder to move said piston and thereby apply a predetermined constant force upon said valve member urging said valve

member toward its full closed position, and means including motor driven timers for controlling the duration of operation of said steam introducing means and said fluid introducing means.

9. In textile setting apparatus of the class described, including a pressure-tight retort having a door opening through which fabric articles may be introduced into the interior of said retort and a door for closing said opening, the combination comprising means for introducing steam under pressure into the interior of said retort in contact with said articles, an exhaust passageway leading from the interior of said retort to the exterior thereof, a freely movable valve member in said passageway for governing the rate of flow of exhaust steam through said passageway for maintaining constant pressure in said retort, said valve member being movable between full open and closed positions and to a plurality of positions intermediate thereof and being so constructed and arranged that force exerted by the pressure of said steam in said retort is directed against said valve member in a direction urging said valve member toward said full open position, a cylinder having a piston therein operatively connected to said valve member, means for introducing fluid at a predetermined pressure into said cylinder to move said piston and thereby apply a predetermined force upon said valve member urging said valve member toward its full closed position, means responsive to the closing of said door for starting the operation of said steam introducing means, and motor driven timers for controlling the starting of the operation of said fluid introducing means and the duration of operation of said steam introducing means and said fluid introducing means.

10. In textile setting apparatus of the class described, including a pressure-tight retort having a door opening through which fabric articles may be introduced into the interior of said retort and a door for closing said opening, the combination comprising means for introducing steam under pressure into the interior of said retort in contact with said articles, an exhaust passageway leading from the interior of said retort to the exterior thereof, a freely movable valve member in said passageway for governing the rate of flow of exhaust steam through said passageway for maintaining constant pressure in said retort, said valve member being movable between full open and closed positions and to a plurality of positions intermediate thereof and being so constructed and arranged that force exerted by the pressure of said steam in said retort is directed against said valve member in a direction urging said valve member toward said full open position, fluid pressure operated means for applying a predetermined force upon said valve member in the opposite direction to urge said valve member toward said full closed position, the relative position of said valve member and the consequent rate of flow of said exhaust steam through said passageway at any given moment being responsive to the difference in value at that moment between said first mentioned force and said predetermined force, first and second timers, means responsive to closing of said door for starting the operation of said steam introducing means and simultaneously starting said first and second timers, means responsive to timing out of said first timer for starting the operation of said fluid pressure operated means, and means responsive to the timing out of said second timer for stopping the operation of said steam introducing means and said fluid pressure operated means.

11. In textile setting apparatus of the class described, including a pressure-tight retort having a door opening through which fabric articles may be introduced into the interior of said retort and a door for closing said opening, the combination comprising means for introducing steam under pressure into the interior of said retort in contact with said articles, first and second exhaust passageways leading from the interior of said retort to the exterior thereof, a freely movable valve member in said first passageway for governing the rate of flow of exhaust steam therethrough, said valve member being movable between full open and closed positions and to a plurality of positions intermediate thereof and being so constructed and arranged that force exerted by the pressure of said steam in said retort is directed against said valve member in a direction urging said valve member toward said full open position, fluid pressure operated means for applying a predetermined force upon said valve member in the opposite direction to urge said valve member toward said full closed position, the relative position of said valve member and the consequent rate of flow of said exhaust steam through said first passageway at any given moment being responsive to the difference in value at that moment between said first mentioned force and said predetermined force, a valve in said second passageway, means for starting the operation of said steam introducing means to flood the interior of said retort with the vapors of said steam, and means automatically actuated a predetermined time interval after the starting of said steam introducing means for simultaneously starting the operation of said fluid pressure operated means and closing said second valve.

12. In textile setting apparatus of the class described, including a pressure-tight retort having a door opening through which fabric articles may be introduced into the interior of said retort and a door for closing said opening, the combination comprising means for introducing steam under pressure into the interior of said retort in contact with said articles, first and second exhaust passageways leading from the interior of said retort to the exterior thereof, a freely movable valve member in said first passageway for governing the rate of flow of exhaust steam therethrough, said valve member being movable between full open and closed positions and to a plurality of positions intermediate thereof and being so constructed and arranged that force exerted by the pressure of said steam in said retort is directed against said valve member in a direction urging said valve member toward said full open position, fluid pressure operated means for applying a predetermined force upon said valve member in the opposite direction to urge said valve member toward said full closed position, the relative position of said valve member and the consequent rate of flow of said exhaust steam through said first passageway at any given moment being responsive to the difference in value at that moment between said first mentioned force and said predetermined force, a valve in said second passageway, means for starting the operation of said steam introducing means to flood the interior of said retort with the vapors of said steam, first and second timers, means responsive to closing of said door for starting the operation of said steam introducing means and simultaneously starting said first and second timers, means responsive to timing out of said first timer for simultaneously closing said second valve and starting the operation of said fluid pressure operated means, and means responsive to the timing out of said second timer for simultaneously opening said second valve and stopping the operation of said steam introducing means and said fluid pressure operated means.

References Cited in the file of this patent

UNITED STATES PATENTS

119,187	Simonin	Sept. 19, 1871
2,451,978	Richter	Oct. 19, 1948
2,520,062	Richter	Aug. 22, 1950
2,548,403	Smith	Apr. 10, 1951
2,710,162	Snoddy	June 7, 1955