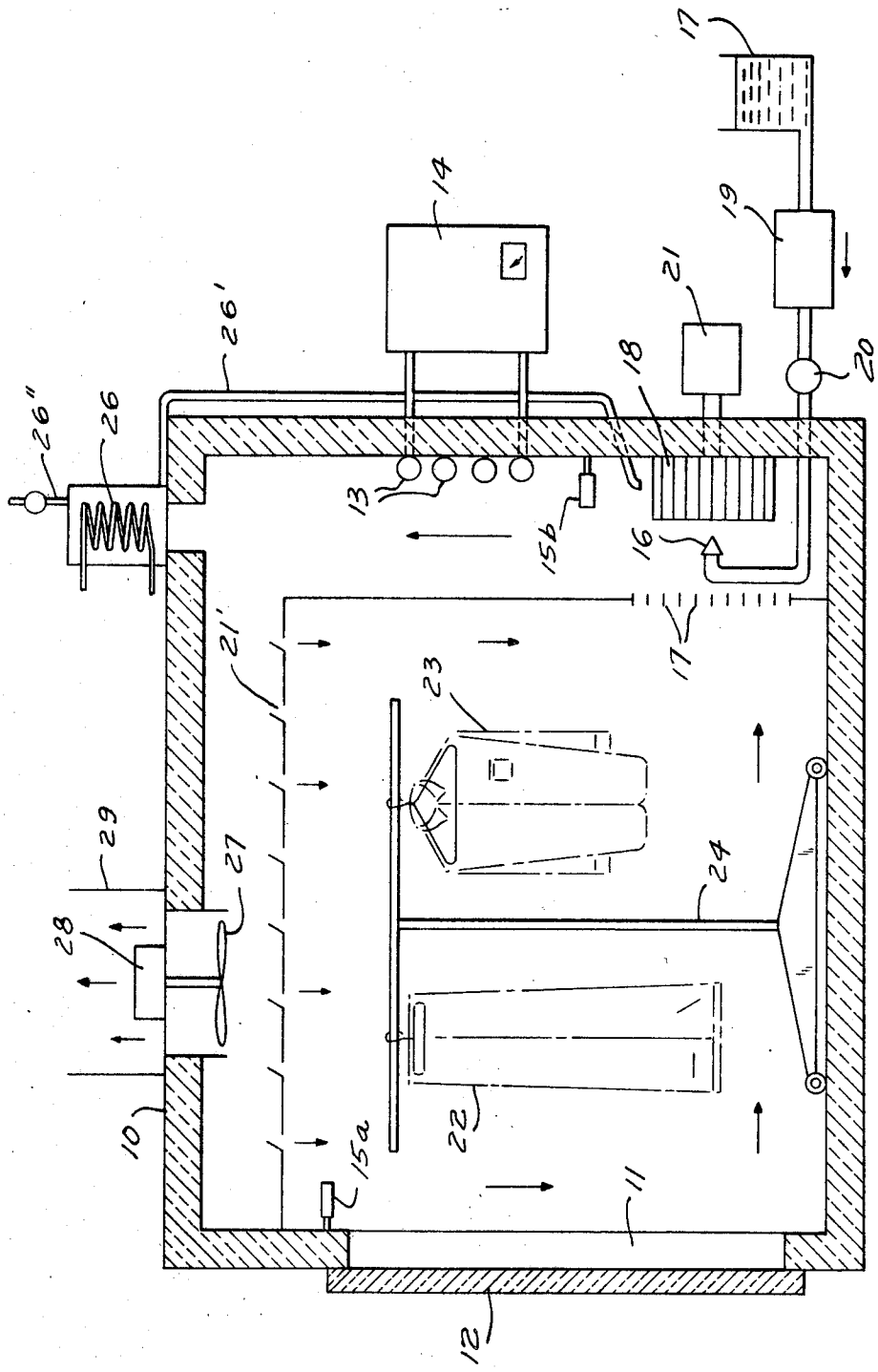
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APPARATUS FOR VAPOR PHASE TREATMENT OF ARTICLES

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APPARATUS FOR VAPOR PHASE TREATMENT OF ARTICLES

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ABSTRACT OF THE DISCLOSURE

Apparatus for the treatment of articles with reagents in the vapor phase in one or more separate stages utilizing a chamber within which said articles are disposed and means for controlling the atmosphere within said chamber.

BACKGROUND OF THE INVENTION

Various techniques by which durable press articles such as garments or fabrics can be obtained are defined in technical literature and known in the textile industry. Apparatus by which such durable press results may be obtained both at the textile finishing plant level, using wet phase techniques, and the apparel manufacturer's level, using various special presses and ovens, are known and described.

Wet processing durable press techniques involve immersing fabric in a water soluble or solvent solution containing suitable cross-linking agents, catalysts, modifiers, etc., then the treated fabric is cured, perhaps washed, and garments made therefrom. Alternately such fabric may be impregnated with reagents, dried (uncured), made into garments, then the resulting garments placed in ovens where the fabric in garment form is cured, merely by the proper exposure in a high temperature environment. The equipment and apparatus to accomplish these techniques are well known and commercially available.

At present the rapidly developing technology in the durable press field indicates a significant departure from wet phase to vapor phase technology. Although apparatus has been developed and used involving the vapor phase concept of treating textiles and garments, none of these has embodied a satisfactory commercial application.

The concept of vapor phase does not require wet application of cross-linking agent and/or catalyst. Untreated fabrics are made into garments and placed into the vapor phase reactor. Articles so treated can be produced at high production rates and have good wrinkle resistance and excellent crease retention with a minimum of chemical quantity and can be produced in an extremely short time cycle.

SUMMARY OF THE INVENTION

An apparatus for the treatment of articles with reagents in the vapor phase utilizing a chamber, means for positioning articles to be treated within the chamber in spaced relation permitting free gas passage around the articles, a carrier gas, means for injecting into, circulating within and emitting from said chamber the carrier gas, means within said chamber for introducing into the carrier gas a mixture of fiber cross-linking agent, a fiber swelling agent and a cross-linkin gactivator, a cleansing gas, and means for injecting into, circulating within and emitting from said chamber the cleansing gas.

THE DRAWING

The drawing is a diagrammatic elevation view of an apparatus constructed in accordance with this invention with articles to be treated shown supported therein and the front of the chamber cut away.

DESCRIPTION OF THE PREFERRED EMBODIMENT

The walls from which the top, bottom and sides of the treating chamber are formed are of heat insulation material. An entrance opening **11** is formed in one of the chamber sides through which a truck or other conveying device may be moved for introducing articles into the chamber. A door **12** or other suitable movable gas-tight closure is provided.

Heating element **13** which can be steam coils, electrical elements, infra-red lamps, quartz lamps or other suitable heat exchange devices powered by generator **14** which is controlled by sensing devices **15***a* and **15***b* are included in or on the chamber walls in order to heat or cool the interior of the chamber in order to attain temperature regulation during treatment of articles within the chamber.

The treating chamber is provided with a chemical inlet at nozzle **16** by which chemicals within external reservoir **17** are introduced into the chamber in the vicinity of centrifugal blower **18** through pump **19** and valve **20**.

The blower **18** contains a plurality of fan blades and the blower motor **21** is preferably of the variable speed type. The fan blades are heated and temperature controlled so that liquid emitted from nozzle **16** and striking the blades will be instantly volatilized and blown upwardly in the direction of the arrows in the drawing under control of the motor **21**.

In the preferred embodiment the blades are heated but need not be in certain instances where the heat from heating element **13** is sufficient to preheat the nozzle and the fan blades.

The reservoir **17** containing the chemicals in liquid form is thermally insulated with heat exchange elements or other temperature controls (not shown) for regulating the temperature of the liquid therein. This liquid mixture may comprise a volatile fiber cross-linking agent: a volatile cellulose swelling agent, a volatile activator for the cross-linking agent, and water. Further, it may contain one or more solvents, a cross-linking catalyst and other chemicals for the vapor phase process.

The passage of liquid from reservoir **17** is controlled by pump **19** and valve **20**. The ratio of liquid to gas within reservoir **17** may be controlled, if desired, by heating the reservoir to volatilize components of the mixture within while leaving the remaining compounds in a liquid state. The liquid, after passing through valve **20**, is conducted through piping to nozzle **16** which is adjustable to control the particle size ejected. The chemical is ejected from the nozzle in spray form or in the shape of fog. The preferred configuration of the spray leaving nozzle **16** is circular or elliptical.

As the gases pass the heating elements **13** they continue to rise to the top of the chamber **10** traveling parallel to the top of the chamber and through a series of baffles or adjustable louvres **21'** downward through the chamber, reacting with the fabric of articles such as garments **22** and **23**, suspended on garment rack **24**. The gases continue to pass downward until they reach the bottom of the chamber, traveling parallel with the bottom wall of the chamber in the direction of the arrows until forced through adjustable louvres **17** behind nozzle **16** where the gas is reintroduced into blower **18**.

In the event the volatilized gases of the liquid sprayed into blower **18** build up a positive pressure within chamber **10**, such pressure variations can be adjusted by use of a condenser coil **26** to cause condensation of gas which condensate can return into the system through pipe **26'**. A vent **26''** is provided to allow gas to escape in a controlled manner. As an alternate form a spill valve and vent can be utilized.

After the cycle has been completed, exhaust fan **27** driven by motor **28** in exhaust vent **29** is activated to remove the gases from the chamber. Upon actuation of fan **27** pump **19** is inactivated. Doors or vents can be provided in the walls of the chamber so that a clean and rapid evacuation of the gases can be accomplished.

It is contemplated to control the length of cycle by suitable timing devices regulating the blower fan **18** and exhaust fan **27**, as well as controls on pump **19** and valve **20**. For example, it is possible to pass 10 pounds of liquid through nozzle **16** at the rate of 1 pound per minute for a ten minute cycle or 5 pounds per minute for two minutes of a ten minute cycle.

The support or garment rack **24** within the chamber **10** may be of various types. It may comprise a horizontal bar from which garments are hung, supported by a vertical rod and stand. In the drawing herein this rack is on wheels permitting a load of suspended garments to be rolled in and out of the chamber without any difficulty.

It is further contemplated that the construction materials for the entire unit can vary widely depending upon the size and number of garments to be treated and on the specific vapor mixture to be used. For example, small laboratory reactors can be built of glass parts or transparent plastic. Industrial units for treating groups of garments may be built of various coated or uncoated metals, or alloys, plastics, etc. It is also contemplated that the position of the various inlet and outlet pipes, fans, blowers, air jets, nozzles, doors, vents, pumps, traps, valves, and others can be varied widely depending on the overall shape and size of the apparatus, the type of articles to be treated and on the volatile mixtures to be used.

It is further contemplated that a multiplicity of nozzles **16** may be employed, each with its own separate source of mixture, containers, pumps, and valves. In addition, a multiplicity of nozzles **16** can be fed from a distributing manifold through which components of mixtures may be fed sequentially.

In lieu of or in conjunction with an air wash, after the garments have been treated for a sufficient time, a gas wash can be employed. This is accomplished by bypassing neutralizing liquids through the same or additional system to introduce the neutralizing liquid at fan **18**. Such neutralizing liquids will volatilize or vaporize on contact with the heated fan blades which will circulate such gases or vapors within the chamber at the required

temperature and time period, to substantially remove any portion of volatile residue of the treating gases present in the garments.

Because of its availability, air is advantageously used as the carrier gas in the treating chamber. However, any other normally gaseous material which would be unreactive with the active treating vapors under conditions prevailing in the treating chamber and other apparatus elements may be used as the carrier gas.

The rate of circulation of the volatilized gases passing over and through the surfaces of the articles being treated may vary between about one to 500 yards per minute. This depends upon the size of the chamber, the number of articles within the chamber, the spacing of the articles, the thickness and the weight of the fabrics from which the articles are made, and related factors.

I claim:

1. An apparatus for the treatment of articles with reagents in the vapor phase including in combination a gas retaining treatment chamber, a liquid inlet in said chamber, a liquid dispersing nozzle of said liquid inlet, a rotary blower within said chamber adjacent and opposite said liquid dispersing nozzle, temperature control means for controlling the temperature of the blades of said blower, said nozzle directing liquid into said blower whereby liquid is converted to gas, a gas outlet of said chamber, a gas withdrawing fan and vent adjacent said gas outlet, and support means within said chamber upon which said articles may be positioned in spaced apart relationship.

2. An apparatus in accordance with claim **1** in which baffle and louvre means are provided within said chamber to direct the flow of gas.

3. An apparatus in accordance with claim **1** in which an entrance opening is provided in a side of said chamber equipped with a movable gas tight closure.

4. An apparatus in accordance with claim **1** in which means are provided to control the temperature of gas in said chamber.

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