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PROCESS FOR TREATING FABRICS

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Fig. 1.

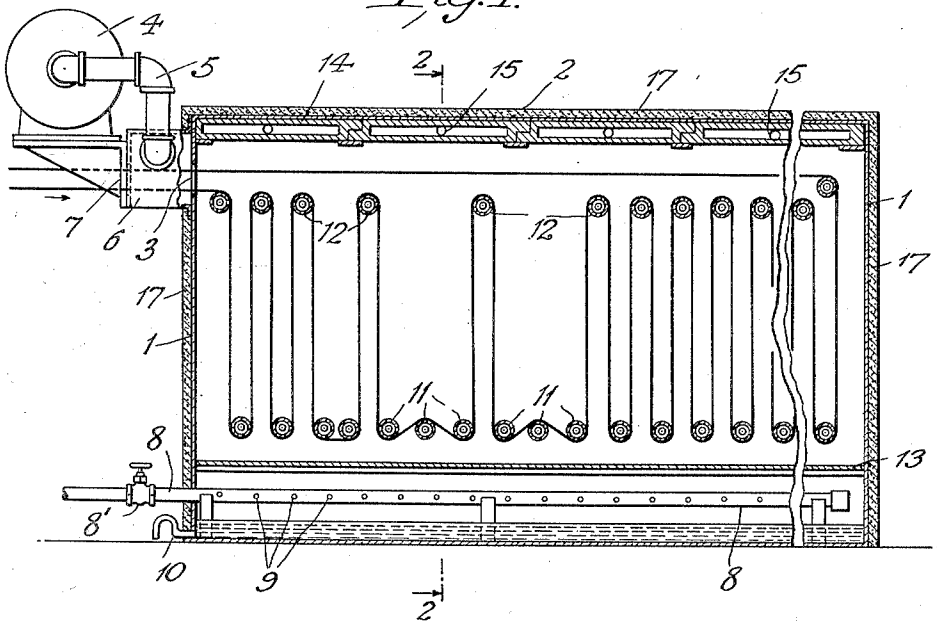
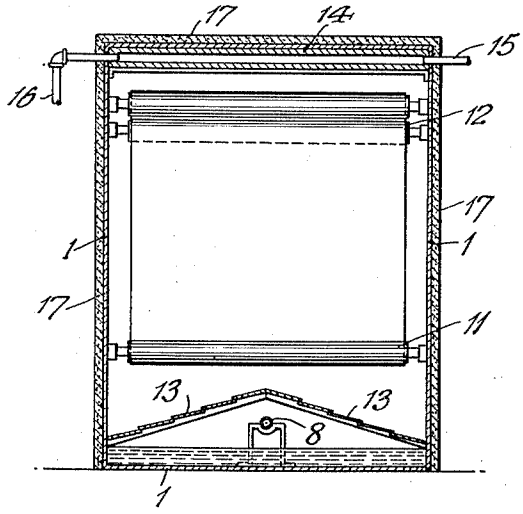


Fig. 2.



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UNITED STATES PATENT OFFICE

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PROCESS FOR TREATING FABRICS

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This invention relates generally to the treatment of fabrics composed of various materials, such as cotton, silk, rayon or wool, or mixtures of said materials, and is particularly applicable to the treatment of fabrics where an ageing action is desired and especially to the treatment of vat color prints or dyes or discharge prints or other fabrics where reductions of the printing materials or dyes are necessary.

Heretofore, the apparatus usually employed in the ageing or treating of vat color prints or dyed fabrics comprised a standard construction which has embodied heating coils or equivalent heating devices and a supply of live steam which is introduced into the box or ager to displace air which contains free oxygen that is detrimental to the reducing action. In the usual type of apparatus, it is customary to have blowers outside and above the point at which the goods enter and leave the ager, such blowers being used to carry off the excess steam which escapes from the ager through openings made necessary by the passage therethrough of the goods being aged or otherwise treated. Also in certain types of agers, blowers or suction devices have been applied directly to the rear end of the ager. Since the actions and reactions which produce heat take place most quickly at the front or entrance portion of the ager, such a suction device carries the excess heat developed at that point throughout the length of the box, thereby raising the temperature of the entire box to a point where the color cannot properly develop, owing to a retardation of the reducing action.

One of the objects of our invention is, therefore, to produce an improved process through which the fabrics being aged may be treated during the ageing process without the usual disadvantages accompanying the use of methods and apparatus heretofore used for this purpose. As above mentioned, it is essential, in such treatment of printed or dyed goods that free oxygen of the atmosphere should be kept away from the portions of the fabric undergoing chemical or other reactions and for that reason the goods are treated in an atmosphere of steam or steam vapors.

In the use of previous ageing apparatus, it has been found impossible to maintain the temperature at a sufficiently low point to carry out the ageing process evenly and satisfactorily because the extent of the liberation of heat has not been known and consequently no remedy provided. We have found that after the introduction of the fabric into the ageing device or apparatus the temperature is caused to rise to 230° or even to 240° F., which is very materially higher than is desirable to carry out the process to produce the best results. After considerable research work as to the cause of this rise in temperature, we have found that it is mainly due to various causes resulting from the actions which occur during the ageing process, and these include the giving off of the latent heat contained in the water vapors when they are condensed upon the fabric as it passes through the apparatus; chemical reactions resulting from the reduction of the dyes, heating coils intended to maintain the temperature; steam chests to prevent condensation; and the heat of the rolls and other metallic parts which tend to absorb and then radiate heat. However, the giving off of latent heat appears to take place whether the fabric has been printed or dyed, or whether it is plain, undyed or unprinted fabric, such as so-called "grey goods," and therefore if it is desired to maintain an even temperature at a definite point in the vicinity of or slightly above 212° F. it has been practically impossible to do so on account of a lack of accurate control and a sufficient dissipation of the heat given off or accumulated as above described. The considerable amount of heat produced by the causes above referred to superheats the steam

introduced, thereby reducing the humidity when the temperature is raised to the undesirable degree above mentioned. To counteract this effect it has been proposed to supply more moisture by the introduction of aprons or blankets between the runs of fabric, and this has been found to produce improved results.

The box or casing of the ager being open to the atmosphere a rise in temperature due to the presence of excess heat can produce no substantial increase in pressure and consequently there results a superheating of the steam and non-uniform temperatures at various points in the apparatus. In the case of printed or dyed fabrics these varying temperatures produce uneven chemical reactions and result in uneven color effects in the goods as well as an imperfect reduction throughout the entire fabric.

In ageing or fabric treating devices heretofore used, it has been customary to cause the fabric to travel in up and down paths over rollers located in the upper and lower portions of the box or casing; these rollers being of such a size and located at such distances apart that the runs of the fabric over the rollers are comparatively close together, that is, the parallel runs have usually been only two or three inches apart and extend continuously and successively from one end of the box or casing to the other. Owing to the close proximity of the runs of the fabric in such cases the heat given off when moisture is absorbed by the fabric is more or less entrapped between the runs thereof so that the temperature usually rises to points that are deleterious to the treatment of the fabric being passed through the ageing device, although moisture may be supplied in sufficient quantity in certain places by blankets or aprons to absorb some of this heat. The amount of heat generated also varies considerably with the various kinds and weights of fabrics being treated.

The common way of determining the temperature within an ageing device has been to insert a short stemmed thermometer so as to extend not more than an inch or two inside of the box near the runs of the fabrics. In most cases the temperature indicated under usual conditions is 212°–215° F. or thereabout, but the use of thermometers in this manner has failed to indicate the real temperatures that exist between the central portions of the runs of the fabric at the points where an accurate control of the temperature is more essential. We have found that it is necessary and essential to so locate a thermometer that the temperature between the runs of the fabric at the central portions of the apparatus may be accurately determined. When this is done we have, as above mentioned, found that the temperatures are considerably above those that are indicated when the short stemmed thermometers located at the sides of the apparatus may have been employed to determine the working temperatures within the ager.

The main object, therefore, of the present invention is to produce a process which shall give greater control over the temperatures within an ageing or fabric treating apparatus so that the defects heretofore encountered may be positively and reliably eliminated.

In general our invention comprises a procedure such that the excess heat produced by condensation of the moisture laden steam vapors, and from other sources, is caused to be dispersed after being liberated so that the fabric may be kept evenly and uniformly at the desired temperature by causing the heat, which has been given off including that produced by the condensation of the moisture upon the fabric to be dissipated or conducted away so that the temperature within the apparatus shall not be raised to a point higher than that necessary to bring about the desired results.

We have found that if the moisture laden steam vapors or wet steam can be caused to circulate rapidly between the runs of the fabric and their movement controlled so as to have the heat conducted away and absorbed by the casing or by some conductive medium at various points, there will be a continuous removal of the excess heat and a consequent reduction in temperature. This circulation and removal of the excess heat may be accomplished in various ways, an example of which is described in connection with the following drawings in which

Fig. 1 is a vertical longitudinal sectional view of one form of apparatus adapted to carry out our process.

Fig. 2 is a vertical cross-sectional view showing the arrangement of the parts taken substantially on the line 2—2 of Fig. 1.

Referring to the figures of the drawing, the numeral 1 indicates a casing of sheet metal which is provided with a top 2, the left hand end of the casing being provided with an opening 3 through which the cloth may enter and emerge from the ager. The opening 3 is provided with means to suck away the steam which would tend to be discharged through said opening, said means preferably comprising the fan or suction device 4 having a pipe 5 leading from the opening 3 and the inner end of which connects with a horizontal hood 6, beneath which the fabric passes, as indicated at 7 in Fig. 1. A steam pipe 8 having a controlling valve 8′ enters the box or casing at a point adjacent its bottom and is provided with a series of small openings 9 through which the steam is discharged in the form of jets. A pipe 10 forms a drain for the water which is condensed from the steam so that the water which may run to the bottom

of the box is conducted away. The pipe 10 is preferably provided with a trap, as indicated, to maintain the water at a definite level. The interior of the box is provided with two series of rolls 11 and 12 over which the cloth being treated passes successively in parallel vertical runs, as indicated in Fig. 1. Between the steam pipe 8 and the lowermost rolls 11 baffles 13, usually known as "shingles", are sometimes used in order to give even distribution of the steam throughout the lower portion of the box and prevent water from spattering on the goods.

The top or upper side of the box is preferably provided with hollow heating plates 14 which are supplied with steam through the pipe 15 and from which condensed water may be conducted away through the pipe 16. The heating plates 14 form a steam chest at the top of the ager and serve to prevent condensation of moisture on the inner surface thereof so that drops of water will not fall upon the fabric being treated. In the form of the apparatus described we separate the heating plates from the upper rolls 12 by a considerably greater distance amounting to 15 to 24 inches instead of 3 to 6 inches as has heretofore been considered desirable and we also preferably use a lower steam pressure in the chest than is commonly used. These features of improvement tend to reduce the heat active upon the fabric and the greater height of the chest above the rolls and fabric reduces the effect of radiant heat falling directly upon the fabric. The box is preferably covered on the sides and top with heat insulating material, such as asbestos, as indicated at 17.

In the form of the apparatus illustrated in the drawings the rolls are arranged in a somewhat different manner from that usually employed in the agers commonly used heretofore. By reference to Fig. 1 of the drawings it will be seen that the first five parallel runs of the cloth are comparatively close together. The next run, or sixth run, is separated from the fifth run by a somewhat greater distance, while the seventh and eighth, as well as the ninth and tenth runs are separated a considerably greater distance than the space between the fifth and sixth runs. Thereafter, from the tenth run of the fabric, until the end of the ager, the runs are separated a distance apart which is closer than the previous runs and substantially similar to the spacing of the first five runs of the fabric. The distances, however, by which the various runs of the fabric are separated will depend upon the nature of the fabric being treated, the size and proportions of the ager, and other factors which will be apparent to one skilled in the art.

The principal difference in arrangement of the rolls and the runs of the fabric above described over the prior use of such rolls in ageing apparatus is mainly in the variable spacing set forth. This variable spacing is required, as we have found from a large number of commercial tests of ageing apparatus, by reason of the fact that when the rolls are spaced closer together throughout the length of the ager, the heat evolved during the actions and reactions which take place upon the fabric by reason of the application of heat and moisture, tended to become trapped, thereby raising the temperature to a point beyond that at which efficient reduction or ageing takes place, as previously referred to. Variable spacing overcomes this difficulty by allowing free circulation of the steam vapors in the immediate vicinity of the surface of the fabric, so that the heat evolved from any cause, such as condensation of the steam or by chemical reactions, is carried away and dissipated without accumulating and raising the temperature within the ager to a detrimental point.

It will, therefore, be apparent that one of the main features of our invention is a rapid dissipation of the excess heat evolved from any cause and a control of the heat which is active to produce the necessary reactions, so that the temperature may be maintained at the proper point for the most efficient reduction and ageing throughout the apparatus. We have found that the most rapid reducing action takes places soon after the fabric enters the ager and the heat at the beginning of the process may be allowed to accumulate to a certain extent to overcome the cooler condition of the fabric as it enters the ager from the outside atmosphere, but after the chemical reactions and the ageing or reducing process have been initiated, it is desirable that further heat evolved be conducted away or dissipated so that the temperature will not be raised to an undesirable point. These considerations explain the closer spacing of the runs of the fabric in the first part of the ageing apparatus and the wider spacing in the portion of the subsequent space within the ager. The latter part of the ager which may consist of practically four-fifths, more or less, of its length, may include closer spacing of the runs of the fabric since the chemical reactions take place in that portion at a considerable lower rate than in the earlier parts of the process, which may include the first one-fifth, more or less, of the length of the ager.

It will be apparent to those skilled in the art that other means for rapidly conducting away the heat may be provided in addition to those represented by the present drawings forming a part of this specification, but what we desire to claim and to protect by Letters Patent is the important feature in the process of ageing, which includes the dissipation of heat from those points where an excess of heat is evolved and a consequent control of

the temperature within an ager to produce the most efficient reduction of the dyes used.

What we claim is:

1. The process of ageing vat color printed or dyed fabric by reduction in an atmosphere of steam vapor which comprises passing the fabric continuously through an atmosphere of steam vapor and causing the excess heat given off by the action of heat and moisture upon the fabric and dyes to be dissipated by a more rapid circulation of the overheated vapor in the immediate vicinity of the surfaces of the fabric where the generation of heat is more intense than elsewhere and supplying saturated steam in place thereof.

2. The process of ageing vat color printed or dyed fabric by reduction in an atmosphere of steam vapor which comprises passing the fabric continuously through an atmosphere of steam vapor and causing the excess heat given off by the action of heat and moisture upon the fabric and dyes at points where the generation of heat is more intense than elsewhere to be dissipated by a more rapid circulation of the overheated vapor from the immediate vicinity of the surfaces of the fabric at said points and supplying saturated steam at the normal temperature in the place thereof.

3. The process of ageing vat color printed or dyed fabric by reduction in an atmosphere of steam vapor which comprises passing the fabric continuously through an atmosphere of steam vapor and causing the excess heat given off by the action of heat and moisture upon the fabric and dyes to be dissipated by a more rapid circulation and withdrawal of overheated vapor from the immediate vicinity of the surfaces of the fabric at predetermined points where the undesirable rises in temperature occur to a greater extent than elsewhere and supplying saturated steam at the normal temperature at such points.

4. The process of ageing vat color printed or dyed fabric by reduction in an atmosphere of steam vapor which comprises passing the fabric continuously through an atmosphere of steam vapor, causing the excess heat given off by the action of heat and moisture upon the fabric and dyes to be dissipated by a more rapid withdrawal of the overheated vapor from the immediate vicinity of the surfaces of the fabric where excess heat is generated, than from elsewhere, supplying saturated steam in the place thereof and controlling the application of external heat in accordance with the excess heat developed at the surfaces of the fabric.

5. The process of ageing vat color printed or dyed fabric by reduction in an atmosphere of steam vapor which comprises passing the fabric continuously through an atmosphere of steam vapor, causing the excess heat given off by the action of heat and moisture upon the fabric and dyes to be dissipated by continuous circulation of the overheated vapor from the immediate vicinity of the surfaces of the fabric at predetermined points, supplying saturated steam to produce the proper degree of moisture and simultaneously controlling the supply of external heat to maintain the proper temperature of the steam vapor active upon the fabric.

Signed this 5th day of December, 1927.

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