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PROCESS AND APPARATUS FOR CONTINUOUSLY NEUTRALIZING DRY ACID CLOTH

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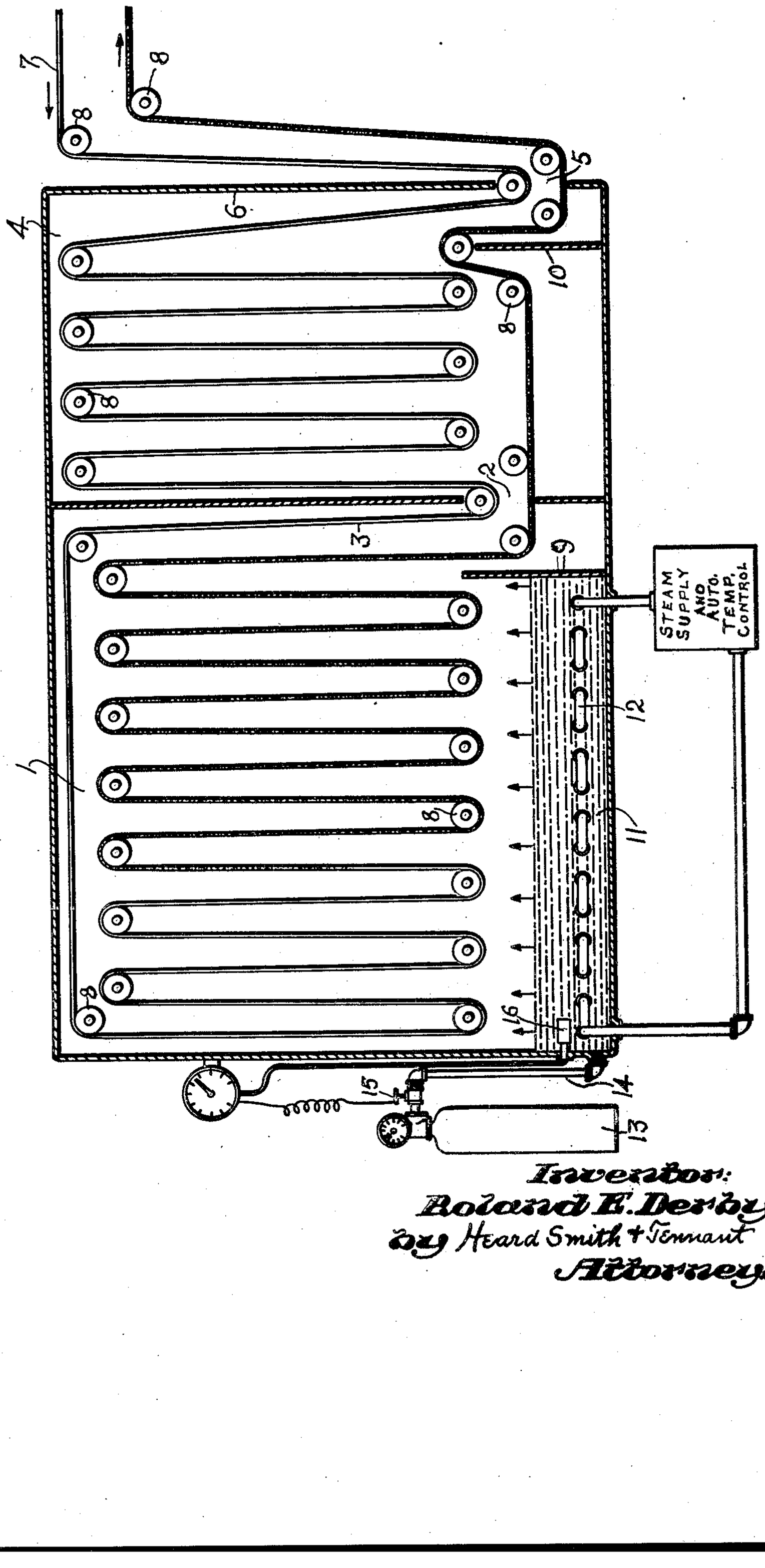

Inventor:
Roland E. Derby,
by Heard Smith & Tennant
Attorneys

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PROCESS AND APPARATUS FOR CONTINUOUSLY NEUTRALIZING DRY ACID CLOTH

Roland E. Derby, Lowell, Mass., assignor, by mesne assignments, to J. P. Stevens & Co., Inc., New York, N. Y., a corporation of Delaware

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11 Claims. (Cl. 8—149.3)

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Cloth containing animal fiber such as woolen or worsted cloth is commonly treated for carbonizing and then carbonized to enable the removal of any foreign substances of vegetable origin such as burrs which cling tenaciously to the wool or other animal fibers. In such carbonization the web of cloth is treated with a suitable acid, sometimes with hydrochloric acid or aluminum chloride, but according to the more general practice, with sulphuric acid. After the carbonizing treatment and the removal of the foreign vegetable material has been effected, it is necessary to neutralize the acid remaining in the cloth, and for that purpose ammonia is the most practical neutralizing agent.

It is the object of the present invention to provide for the neutralization of the acid cloth and to leave it after neutralization in a dry state and further to carry out the neutralization as a continuous operation. Processes and apparatus are in use for effecting carbonization and removal of the carbonized matter while the cloth is continuously traveling, and with this invention the neutralizing operation may now be performed as a subsequent continuous operation upon the continuously traveling cloth.

It is highly important that the cloth after neutralization shall be in a dry condition particularly when the neutralized cloth is to be dyed or subjected to either soap or water fulling, and an important feature of the invention resides in so neutralizing the dry acid cloth that it is left in dry condition after neutralization has been effected.

It is a further object of the invention to neutralize the dry acid cloth, while it is continuously traveling, by ammonia gas.

It is a further object of the invention, particularly when the cloth has been treated with sulphuric acid, to effect the continuous neutralization by supplying the ammonia gas in the presence of water vapor which is readily absorbed by the sulphuric acid and acts somewhat in the nature of a catalyst to speed up the neutralizing action of the ammonia gas.

It is a further object of the invention so to correlate and control the neutralizing action in relation to the speed of travel of the cloth that complete neutralization of the acid in the cloth is effected and further so as to prevent discharge of the neutralizing gas into the atmosphere.

In the neutralizing of the dry acid cloth in accordance with this invention, the cloth travels through a chamber within which it is subjected to the neutralizing gas, and a further important

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feature of the invention resides in providing the neutralizing gas in excess of that required for neutralization while the cloth is traveling through and is within this chamber and in directing this excess of gas as it is discharged from the chamber into contact with the unneutralized dry acid cloth as it travels to the chamber and in and while it is traveling through a supplemenary or guarding chamber so that this unneutralized dry acid cloth traveling to the neutralizing chamber effects absorption of any excess neutralizing gas. Thus complete neutralization is insured in the neutralizing chamber, and at the same time the escape of any neutralizing gas into the atmophere is prevented.

These and other objects and features of the invention will appear more fully from the description and drawing and will be particularly pointed out in the claims.

The drawing illustrates diagrammatically a simple form of apparatus embodying the invention and for carrying out the process of the invention. Since the materials and appliances and details of construction requisite for a suitable apparatus will be readily understood by those familiar with cloth treatment, it is sufficient to illustrate the apparatus in this diagrammatic form.

In the illustrated embodiment, the apparatus comprises a suitable chamber 1 herein referred to as the "neutralizing chamber." The top, bottom and four walls are all closed except for an opening near the bottom at 2 in the front wall 3. There is provided in front of the neutralizing chamber 1 another chamber 4 hereinafter referred to as the "safeguard chamber." This safeguard chamber is also closed at the top, bottom and at the four side walls except for an admission and exit opening. Preferably the front wall 3 of the neutralizing chamber forms the rear wall of the safeguard chamber, and the opening 2 is the sole connection between the two chambers while the admission opening to the safeguard chamber is at 5 in the bottom of the front wall 6.

The web of cloth 7 is guided in its movement into, through, and out of the apparatus by a plurality of suitably located rolls 8 and travels continuously, its speed of travel being determined by any of the suitable mechanisms commonly employed for effecting the continuous travel of a web of cloth. In its travel the cloth enters the safeguard chamber through the opening 5 and is guided by the rolls 8 in the safeguard chamber preferably through a plurality of substantially vertical paths. Thence it passes through the connecting opening 2 into the neutralizing chamber

and is again guided by the rolls preferably through a plurality of vertical paths. Thence, it passes directly back through the connecting opening 2 through the safeguard chamber, out the opening 5 and is stored or passed to some other treating step such as fulling.

A baffle 9 extends up from the bottom wall of the neutralizing chamber above the opening 2, and a similar baffle 10 extends up from the bottom of the safeguard chamber above the opening 5 to guide the gas upward at the openings.

A pool of water 11 is located and maintained in the bottom of the neutralizing chamber and extends beneath the paths of travel of the cloth. Suitable means are provided for heating this pool of water and for automatically maintaining the temperature thereof. Such means are indicated as the coils of pipe 12 extending from and back to a suitable source of steam supply and a suitable automatic temperature control. Since means for thus supplying steam and automatically controlling the temperature of the water heated by the steam are well-known devices, they are only illustrated diagrammatically.

Dry ammonia gas is the re-agent employed in the neutralizing operation, and for that purpose there is illustrated a tank 13 of such gas connected by the pipe 14 to the neutralizing chamber and opening into the pool of water. This pipe is provided with a valve 15 which is under the control of a standard "electric pH control" having its foot 16 located in the pool of water 11. This device operates to control the supply of ammonia gas to the pool of water so as to maintain a predetermined constant pH of the solution of the gas in the water.

It is well recognized that, in a solution of ammonia gas in water, part of the ammonia exists as molecular ammonia and part as ammonium hydroxide and that, when the solution is heated, ammonia gas is given off. The present invention makes use of this principle.

The automatic temperature control is regulated so as to maintain the temperature of the solution such as required to liberate the ammonia gas and at the same time water vapor from the surface of the pool. And for this purpose, the temperature should be maintained between 160° F. and well below the boiling point. At the same time the electric pH control is set depending upon the amount and speed of travel of the cloth within the neutralizing chamber to maintain a predetermined pH of the gas in water solution and preferably so as to maintain the water saturated with the ammonia gas, because if more gas is supplied to the water, than to maintain saturation, it would pass directly through the water without passing into solution.

It will now be seen that under the stated conditions ammonia gas is discharged along with water vapor through the entire upper surface of the pool and, therefore, fills the neutralizing chamber and comes into intimate contact with the cloth, an operation which is materially assisted by the plurality of vertical paths through which the cloth is traveling. The water vapor as previously pointed out acts merely to assist in the absorption of the ammonia gas by the acid and does not act to wet the cloth.

In order further to insure complete neutralization of the acid in the cloth within the neutralizing chamber, the correlation effected is preferably such as to secure and maintain a discharge from the surface of the pool of an amount of the gas in excess of that required to neutralize the

acid in the cloth while in the chamber. This excess of gas can only escape through the opening 2 into the safeguard chamber, and there it comes into contact with the un-neutralized acid cloth traveling to the neutralizing chamber. A sufficient amount of this un-neutralized cloth is maintained, preferably, in the vertical paths of travel illustrated, in the safeguard chamber to insure absorption of any excess gas by the acid in the un-neutralized cloth. Thus not only is complete neutralization insured in the neutralizing chamber, but the excess gas is prevented from escaping from the apparatus.

It will thus be seen that by controlling the temperature of the water and the flow of the ammonia gas into the water, as determined by the pH of the solution, the ammonia gas and water vapor may be correlated to the speed of travel of the cloth or, in other words, to the amount of acid carried by the cloth so as continuously to effect complete neutralization of the acid in the cloth and leave the thus neutralized cloth in a dry condition. The cloth may then be stored without danger of injury due to the presence of acid or it may be passed to a subsequent treatment such as dyeing, soap fulling, or water fulling where the presence of acid would interfere with such subsequent treatment.

I claim:

1. The process of continuously neutralizing dry acid cloth which consists in causing the cloth continuously to travel through a chamber, continuously supplying to the chamber ammonia gas and water vapor, and in correlating the amount of acid in the cloth while in the chamber and the amount and proportions of the gas and water vapor continuously supplied to the chamber to effect the neutralization of the acid in the cloth as it passes through the chamber.

2. The process of continuously neutralizing dry acid cloth which consists in causing the cloth continuously to travel through a chamber, continuously supplying to the chamber ammonia gas and water vapor, and in correlating the amount of acid in the cloth within the chamber and the amount of the gas supplied to the chamber to maintain in the chamber an amount of the ammonia gas in excess of that required to effect neutralization of the acid in the cloth, and in directing any excess of said gas discharged from the chamber into contact with the unneutralized dry acid cloth traveling to the chamber to effect absorption of said excess gas by the acid cloth.

3. The process of continuously neutralizing dry acid cloth which consists in causing the cloth continuously to travel through a chamber closed except for entrance and emergence of the cloth, in heating a pool of water in the bottom of the chamber, in feeding ammonia gas into the pool of water, in automatically controlling the feed of the gas to maintain a predetermined pH of the pool, in controlling the temperature of the water to maintain the discharge of a predetermined amount of gas and water vapor from the surface of the pool, and in correlating the pH and the temperature of the water to the amount of acid carried by the cloth to effect neutralization of the acid in the cloth while in the chamber.

4. The process of continuously neutralizing dry acid cloth which consists in causing the cloth continuously to travel through a chamber closed except for entrance and emergence of the cloth, in heating a pool of water in the bottom of the chamber, in feeding ammonia gas into the pool of water, in automatically controlling the feed of

the gas to maintain a predetermined pH of the water, in controlling the temperature of the water to maintain the discharge of a predetermined amount of water vapor from the surface of the pool, and in correlating the pH and the temperature of the water to secure and maintain a discharge from the surface of the pool of an amount of the ammonia gas in excess of that required to neutralize the acid in the cloth while in the chamber, and in directing the excess of said gas discharged from the chamber into contact with the unneutralized dry acid cloth traveling to the chamber to effect absorption of said excess gas by the acid cloth.

5. The process of disposing of a neutralizing gas supplied to a chamber closed except for entrance and emergence of the cloth in excess of that required for the neutralization of a dry acid cloth while traveling through and within said chamber which consists in directing the excess of said gas discharged from the chamber into contact with the unneutralized dry acid cloth while traveling out of engagement with the atmosphere to the chamber to effect absorption of said excess gas by the acid cloth.

6. An apparatus for continuously neutralizing dry acid cloth comprising a neutralizing chamber, means for causing the cloth continuously to travel through the neutralizing chamber, a pool of water in the bottom of the neutralizing chamber, means for continuously supplying ammonia gas to said pool of water to maintain a predetermined pH of the solution, means for heating the solution to cause a continuous uniform separation of ammonia gas and water vapor from the surface of the pool, and means for correlating the pH of the solution and the temperature of the water to the amount of acid carried by the cloth within the chamber to effect the neutralization of the acid in the cloth while in the chamber.

7. An apparatus for continuously neutralizing dry acid cloth comprising a neutralizing chamber, means for causing the cloth continuously to travel through the neutralizing chamber, a pool of water in the bottom of the neutralizing chamber, means for continuously supplying ammonia gas to said pool of water to maintain a predetermined pH of the solution, means for heating the solution to cause a continuous uniform separation of ammonia gas and water vapor from the surface of the pool, and means for correlating the pH of the solution and the temperature of the water to the amount of acid carried by the cloth within the chamber continuously to supply an amount of gas within the chamber in excess of that required to neutralize the acid in the cloth while in the chamber, and means for directing any excess of said gas discharged from the chamber into contact with the unneutralized dry acid cloth traveling to the chamber to effect absorption of said excess gas by the acid cloth and prevent escape of said gas to the atmosphere.

8. An apparatus for continuously neutralizing dry acid cloth comprising contiguous neutralizing and safeguard chambers, the neutralizing chamber closed except for an opening near the bottom connecting it to the safeguard chamber and the latter chamber closed except for said connecting opening and an admission opening near the bottom, means for guiding the cloth into and through said admission opening, thence through a plurality of substantially vertical paths in said

safeguard chamber, thence through the connecting opening, thence through a plurality of substantially vertical paths in the neutralizing chamber, thence back through said connecting and admission openings, means for continuously supplying to the neutralizing chamber a neutralizing gas in excess of that required to neutralize the acid in the cloth within the neutralizing chamber, but insufficient to neutralize the acid in the cloth within the safeguard chamber thereby to prevent any discharge of the neutralizing gas from the apparatus.

9. The process of continuously neutralizing dry acid cloth which consists in causing the cloth continuously to travel through an apparatus closed except for entrance and emergence of the cloth and containing connected neutralizing and safeguard chambers, in subjecting the cloth in the neutralizing chamber to an acid neutralizing gas in an amount in excess of that required to neutralize the acid in the cloth, in directing any excess of said gas discharged from the neutralizing chamber into contact with the unneutralized dry acid cloth while traveling through the safeguard chamber to the neutralizing chamber to effect absorption of said excess gas by the acid in the safeguard chamber, and in maintaining the amount of said excess gas less than that which can be absorbed in the safeguard chamber.

10. The process of continuously neutralizing dry acid cloth which consists in causing the cloth continuously to travel through a chamber closed except for entrance and emergence of the cloth, in continuously supplying to the chamber ammonia gas and water vapor, and in regulating the amount of said gas thus supplied by the amount of acid in the cloth in the chamber to effect the neutralization of the acid in the cloth while within the chamber.

11. An apparatus for continuously neutralizing dry acid cloth comprising a neutralizing chamber through which the cloth travels and is subjected therein to an acid neutralizing gas, a safeguard chamber through which the cloth passes in its travel both into and out of the neutralizing chamber and into which any excess gas is discharged from the neutralizing chamber, and means for continuously supplying to the neutralizing chamber the acid neutralizing gas in excess of that required to neutralize the acid in the cloth within the neutralizing chamber, but insufficient to neutralize the acid in the cloth within the safeguard chamber thereby to prevent any discharge of the neutralizing gas from the apparatus.

ROLAND E. DERBY.

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