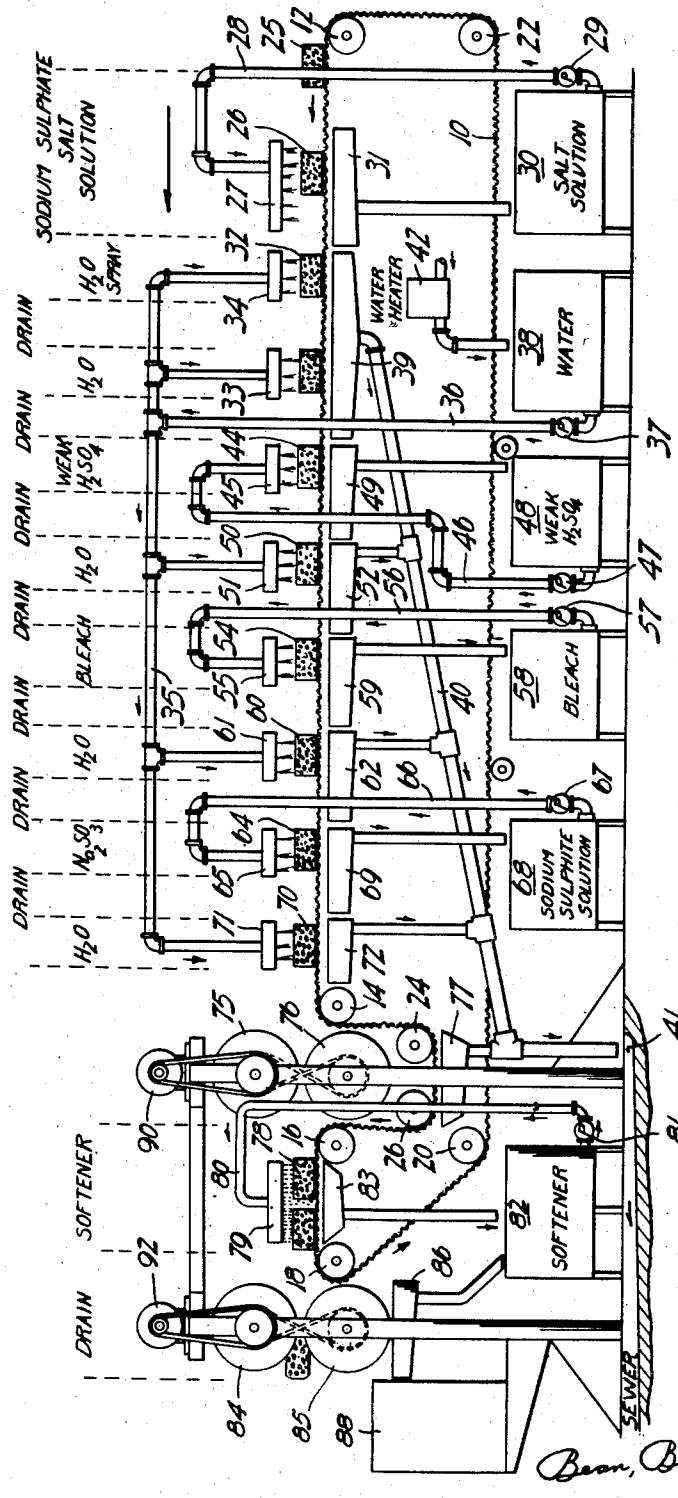
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CELLULOSE PRODUCTS PURIFICATION APPARATUS

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CELLULOSE PRODUCTS PURIFICATION APPARATUS

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This invention relates to improvements in the art of manufacturing regenerated cellulose products, and more particularly to an improved apparatus for continuously treating and purifying regenerated cellulose sponge products in connection with large scale manufacture thereof.

Whereas, in the art of regenerated cellulose sponge manufacture, it has heretofore been customary to batch-treat blocks of such sponge material to decolorize and bleach and scavenge such products of residual chemical solutions; such prior methods are unsuited to continuous large scale production operations. Nevertheless, the provision of continuous purification apparatus for the aforementioned purpose has been beset by certain difficulties and disadvantages. For example, because the chemicals necessarily employed in connection with such operations are relatively costly and because large quantities thereof must be used in connection with large scale operations, it is essential that a large proportion of the chemicals be recovered for reuse if the process is to be economically practicable. However, inasmuch as the chemicals which are successively employed must be water-rinsed from the product there is a tendency for the chemicals to become so diluted prior to recovery thereof, as to be inefficient for reuse.

Therefore, it is one of the objects of the present invention to provide an apparatus for continuously receiving separate blocks or sheets of cellulose sponge material and treating them to successive chemical and water bath treatments in an improved manner.

Another object of the invention is to provide an apparatus for the purposes aforesaid wherein the treating chemical solutions are effectively employed for the purposes thereof and substantially recovered for reuse without undue dilution thereof.

Still another object of the invention is to provide an apparatus for the purposes aforesaid, whereby a finished product of improved purity and cleanliness is produced.

Still another object of the invention is to provide an apparatus as aforesaid which may be economically employed so as to obtain definite economies in the manufacture of such products.

Other objects and advantages of the invention will appear from the specification hereinafter.

In the drawing the figure is a side elevation, with portions shown in vertical section, of an apparatus of the invention.

The apparatus includes an endless conveyor **10** which may be of any suitable construction so as to be substantially perforate to permit ready drainage of liquid therethrough; and the conveyor may be constructed for example of chain-like form of metal which is non-reactive with the chemicals coming in contact therewith. Or, the conveyor may be formed of any other suitable material, as may be preferred. In any case the conveyor is arranged to pass around top strand pulleys **12—14—16—18** and around return stand pulleys **20—22**; the top strand portion of the conveyor being trained around by-pass pulleys **24—26** for purposes to be explained hereinafter. Stanchions (not shown) are arranged to support the conveyor so that the top strand extends substantially horizontally, and one or more of the conveyor pulleys is arranged to be power-driven so as to operate continuously to move the conveyor at the top strand portion thereof from right to left as viewed in the drawing. Thus, the feed end of the conveyor is at the right hand end of the drawing, and of course any suitable arrangement may be employed to deliver to the conveyor the supply of regenerated cellulose which is to be treated by the apparatus, for example at the position indicated at **25**.

Thus, as the conveyor operates to move the product toward the left as viewed in the drawing, each article deposited upon the conveyor is first brought into position as indicated at **26** so as to be disposed beneath a spray head **27** which continuously discharges a sodium sulphate salt solution from a conduit **28** which is fed by means of a pump **29** from a supply tank **30**. For convenience hereinafter, the sodium sulphate solution will sometimes be referred to as Glauber salt solution. A catch basin **31** is disposed beneath the position of the spray head **27** to recover the unused Glauber salt solution and return it to the tank **30**. The purpose of the Glauber salt solution treatment at the position **26** is to subject the product to a scavenging and leaching action to substantially eliminate the sodium sulphate salt which still remains in the product after it comes from the coagulation bath which comprises the previous step in the manufacture of the product. Whereas such residual salts could be washed out by water, such an operation would result in production of large quantities of very dilute sodium sulphate solutions which would be uneconomical to treat for recovery of the valuable chemical therefrom. Therefore the invention contemplates use of a regulated concentration Glauber salt solution as stated hereinabove, which is dilute enough to leach out residual salt in the product at the position **26**, but which produces an end solution of such concentration as to permit economical recovery of the salt therefrom, as by means of another operation not shown or discussed herein.

Then, as the article moves on to the position thereof indicated at **32** it passes underneath a pair of rinse water spray heads **33—34** which are supplied with clear warm water from a conduit **35** which is in turn fed through a conduit **36** by a pump **37** from a water supply tank **38**. A catch basin **39** is disposed below the position of the spray heads **33—34** and somewhat therebeyond so as to catch all water and leached-out chemical solutions from the article; said drainage materials being led off to a sewer as indicated at **41**. To complete the diagrammatic illustration of the apparatus a water heater is illustrated at **42** for the purpose of heating the fresh supply of water for the tank **38**; it being understood of course that suitable floats and valve control devices will be employed in connection with the heater **42** so as to maintain the water level and temperature at the desired degree.

The article is then carried by the conveyor to a position as indicated at **44** whereat it is subjected to a weak sulphuric acid solution from a spray head **45**; the acid solution being furnished by a conduit **46** and pump **47** from a tank **48**. A catch basin **49** is arranged to recover the acid solution not absorbed by the article while at the position designated **44**, to return the unused acid solution to the tank **48**. The sulphuric acid treatment completes the regeneration of the cellulose and chemically reacts with foreign materials therein to permit their ready removal in subsequent operations. The article next moves to the position thereof designated **50** whereat it is subjected to a water spray from a head **51** which receives a supply of water from the conduit **35**. A catch basin **52** is arranged to catch the water and leached-out chemicals from the article and to direct the waste liquid to the sewer conduit **40**.

The article next moves to position indicated **54** whereat it receives a spray of bleaching solution, such as sodium hypochlorite, from a spray head **55**; the spray head being supplied through a conduit **56** and a pump **57** from a supply tank **58**. A catch basin **59** is disposed under the position of the spray head **55** so as to recover any bleaching solution not absorbed by the article and to return it to the tank **58**. The article next moves to the position thereof designated **60** whereat it receives a spray of rinse water from a spray head **61** which is coupled to the water conduit **35**. A catch basin **62** directs the rinse water and leached-out chemicals into the sewer conduit **40**. The article next moves to the position thereof designated **64** whereat it receives a spray of bleach neutralizing solution, such as a sodium sulphite solution which is furnished by a spray head **65** and a conduit **66** and a pump **67** from a supply tank **68**. A catch basin

69 collects any unused sodium sulphite solution and returns it to the tank 68. The article next moves to the position thereof designated 70 whereat it receives a final water rinse spray from a sprayhead 71 which connects to the water supply conduit 35. A catch basin 72 is provided to direct the rinse water and leached-out chemicals into the sewer conduit 40.

At the position of the conveyor by-pass arrangement as defined by the by-pass rollers 24—26, there is provided a squeeze roller arrangement consisting of a pair of squeeze rolls 75—76 which are arranged to receive therebetween the articles as they are delivered by the conveyor subsequent to the series of treatments hereinabove recited. Thus, the articles move from the position thereof designated 70 into the nip gap between the rolls 75—76 and are thereby simultaneously squeezed and conveyed by the rolls therethrough and then delivered again upon the conveyor at its point of travel over the roller 16. Thus, while passing through the rolls 75—76 substantially all of the liquids within the article are squeezed therefrom and fall by gravity into a catch basin 77 which delivers into the sewer conduit.

Thus, as the article is again delivered to the conveyor at the position thereof indicated 78 it is substantially liquid free, and at that point it receives a spray of glycerine or other softening agent from a sprayhead 79 which is supplied by a conduit 80 and pump 81 from a softener supply tank 82. A catch basin 83 is disposed beneath the position of the sprayhead 79 so as to recover any unused softener and to return it to the tank 82. Again, as the article moves to the left under the sprayhead 79 it ultimately passes over the end roller 18 and is thence delivered into the nip gap of another pair of squeeze rolls 84—85 which are arranged to receive the article and to pass it therebetween while substantially squeezing all of the liquid therefrom. A catch basin 86 is arranged to catch the liquid draining from the product, and inasmuch as this liquid is substantially pure softener, the return is to the softener tank 82. As the articles move out of the squeeze rolls 84—85 they tumble downwardly into a catch box 88 or the like from which they may be removed by any suitable means as may be preferred. Squeeze rolls 75 and 76 are driven from motor 90 through a conventional drive belt arrangement, and squeeze rolls 84 and 85 are driven by a motor 92 through a similar drive belt arrangement.

Thus, it will be appreciated that the apparatus of the invention provides a continuously operating mechanism whereby regenerated cellulose sponge articles are received successively at one end of the apparatus and are continuously fed therethrough to receive successive treatments comprising a sodium sulphate salt treatment; a sulphuric acid treatment; a bleach treatment; a bleach neutralizer treatment; and a softener treatment; all of said treatments being interspersed by intermediate water rinse treatments. Thus, the regenerated cellulose products are thoroughly purified and bleached and finally delivered into the catch box 88; the final glycerine or softening treatment being employed to increase the hydroscopicity and softness of the product. It is a particular feature of the invention that throughout the treating processes thereof provision is made for recovering substantially all of the unused chemical solutions while avoiding undue dilution thereof by the intermediate water rinse treatments.

I claim:

1. A regenerated cellulose purification apparatus comprising in combination, a perforate conveyor, means continuously driving said conveyor to move the same at a uniform rate whereby cellulose products deposited upon one end of said conveyor will be conveyed thereby to the other end thereof, separate chemical solution, supply tanks containing a Glauber salt solution a sulphuric acid solution, a bleaching solution, a bleaching neutralizer solution, and a softener solution, respectively, supply tank means containing rinse water, plural spray head means disposed over said conveyor at intervals lengthwise thereof and extending from said one end of said conveyor to said other end thereof, means conveying said chemical solutions to spaced spray heads including the first and the last thereof in the order named beginning at said one end of said conveyor, means conveying rinse water to the remaining spray heads, whereby as cellulose products are carried by said conveyor they are subjected successively to showers of said chemical solutions in the order named and to showers of rinse water intermediately of each of said showers of chemical solutions, separate catch basin means disposed under said conveyor in the regions of the spray head means delivering showers of chemical solutions and communicating with said supply tanks to return the unused portions of said chemical solution showers to their respective tanks, a sewer connection, catch basin means disposed beneath said rinse water spray head devices and communicating with said sewer connection to catch used rinse water and convey the same to said sewer connection, and squeeze roller means disposed on each side of the spray head being supplied with said softener solution for squeezing the cellulose products both prior to and subsequent to the softener treatment thereof.

2. A regenerated cellulose purification apparatus comprising in combination, a perforate conveyor, means driving said conveyor at a uniform rate whereby cellulose products deposited upon one end of said conveyor will be conveyed thereby to the other end thereof, plural chemical solution spray head means disposed at spaced intervals lengthwise of said conveyor, separate chemical solution supply tanks containing a Glauber salt solution, a sulphuric acid solution, a bleaching solution, a bleaching neutralizer solution, and a softener, respectively, conduit means connecting said chemical solution spray head means to said chemical solution supply tanks in the order named beginning with the chemical solution spray head means closest to said one end of said conveyor, rinse water spray head means disposed intermediate each of said chemical solution spray head means, means supplying rinse water to each of said rinse water spray head means, whereby cellulose products carried by said conveyor are subjected successively to showers of chemical solutions in the order named and to rinse water baths intermediately of each chemical solution shower, separate catch basin means disposed under said conveyor in the region of said chemical solution spray head means and communicating with said respective chemical solution supply tank means to return the unused portion of each chemical solution shower to its proper supply tank, a sewer connection, and catch basin means disposed beneath said rinse water spray head devices to catch the used rinse water and convey the same to said sewer connection.

3. A regenerated cellulose purification apparatus comprising in combination, a perforate conveyor, means continuously driving said conveyor at a uniform rate whereby cellulose products deposited upon one end of said conveyor will be conveyed thereby to the other end thereof, plural chemical solution spray head means disposed at positions lengthwise of said conveyor, separate supply tanks containing different chemical solutions and a softener solution, means supplying said chemical solutions to said chemical solution spray head means with said softener solution being supplied to the chemical solution spray head means adjacent said other end of said conveyor, rinse water spray means disposed intermediate each of said chemical solution spray head means, whereby cellulose products being conveyed by said conveyor are subjected successively to showers of different chemical solutions terminating in a softener solution shower and to a rinse water shower intermediate of each of said chemical solution showers, catch basin devices disposed under said conveyor in the regions of said spray head means and communicating with said supply tanks to return the unused portions of said chemical solution showers to their respective supply tanks, catch basin means separate from said chemical solution catch basin devices disposed under said conveyor in the region of said rinse water spray means for catching water and leached-out chemical solutions from the product being treated, and squeeze roller means disposed ahead of and behind said softener chemical solution spray head means for squeezing the cellulose products prior to and subsequent to the softener treatment thereof.

4. A regenerated cellulose purification apparatus comprising in combination, a perforate conveyor, means continuously driving said conveyor at a uniform rate whereby cellulose products deposited upon one end of said conveyor will be conveyed thereby to the other end thereof, spray head means disposed at positions lengthwise of said conveyor, supply tank means containing different chemical solutions and a softening solution, means supply-

ing each of said spray head means with a chemical solution from one of said supply tank means with the spray head means closest to said other end of said conveyor being supplied with said softening solution, rinse water spray means disposed intermediately of each of said spray head means, whereby cellulose products being conveyed are subjected successively to showers of different chemical solutions terminating in a shower of softening solution and to a rinse water shower intermediate of each of said chemical solution showers, catch basin devices disposed under said conveyor in the regions of said spray head means and communicating with said supply tank means whereby the unused portions of said chemical solution showers are returned to their respective supply tanks, and catch basin means separate from said chemical solution catch basin devices disposed under said conveyor in the region of said rinse water spray means for catching water and leached-out chemical solutions from the product being treated.

5. A regenerated cellulose purification apparatus comprising in combination, a perforate conveyor, means driving said conveyor whereby cellulose products deposited upon one end of said conveyor will be conveyed thereby to the other end thereof, chemical solution spray head means disposed at intervals lengthwise of said conveyor, separate supply tanks containing a Glauber salt solution, a sulphuric acid solution, a bleaching solution, and a bleaching neutralizer solution, means supplying said chemical solution spray head means with the solutions

in said supply tanks in the order named starting at said one end of said conveyor, rinse water spray head means disposed between successive chemical solution spray head means, rinse water supply means communicating with said rinse water spray head means, whereby as cellulose products are conveyed by said conveyor they are subjected to successive showers of said different chemical solutions and to rinse water showers intermediately of each of said chemical solution showers, catch basin devices disposed under said conveyor in the regions of the chemical solution spray head means and communicating with said separate supply tanks to return the unused portions of said chemical solution showers to their respective supply tanks, and catch basin means separate from said chemical solution catch basin devices disposed under said conveyor in the region of said rinse water spray means for catching water and leached-out chemical solutions from the product being treated.

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