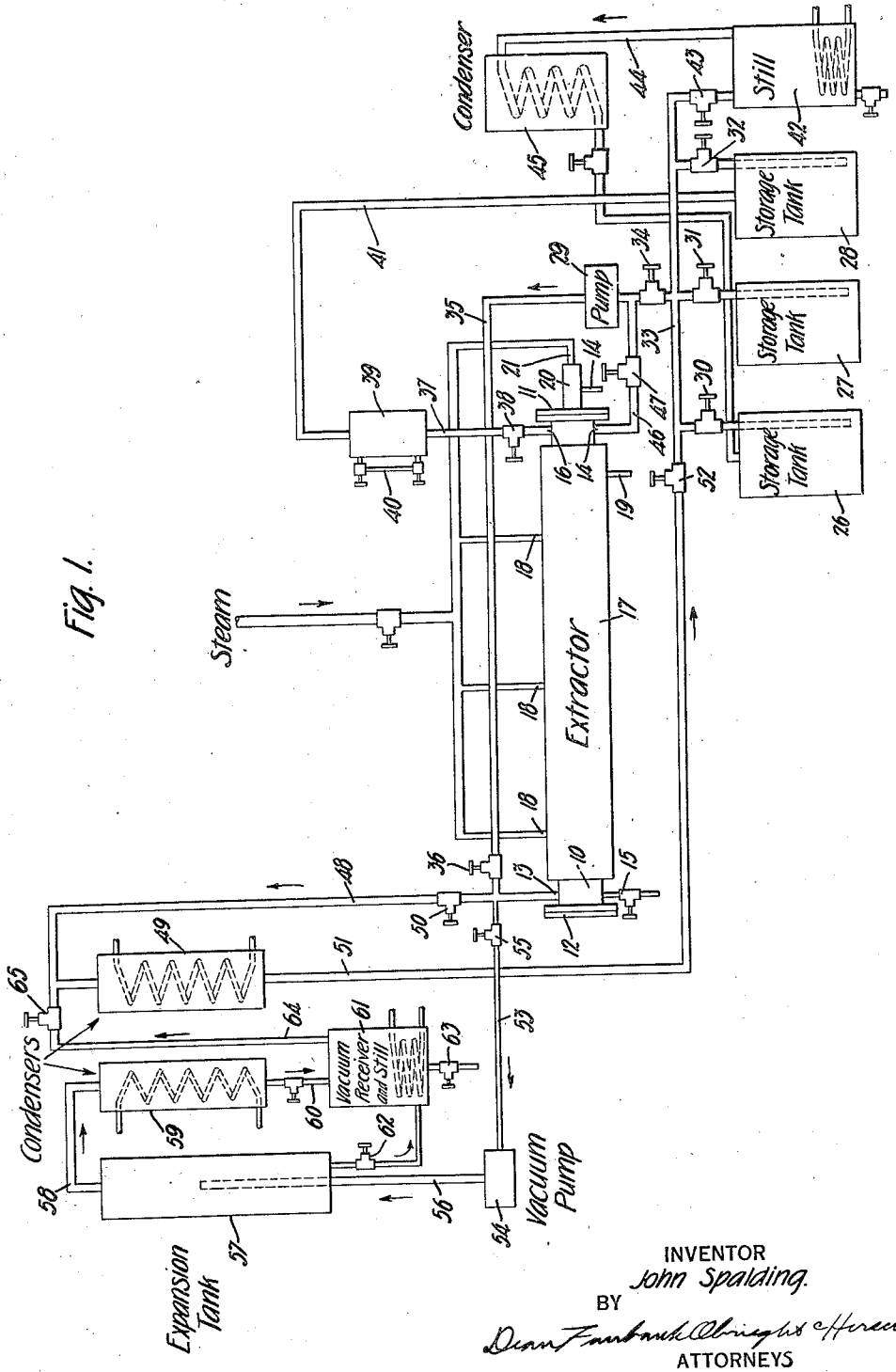
June 28, 1932. J. SPALDING 1,865,218

APPARATUS FOR TREATING ROLLED FABRIC

Filed April 7, 1928 2 Sheets-Sheet 1

Fig. 1.



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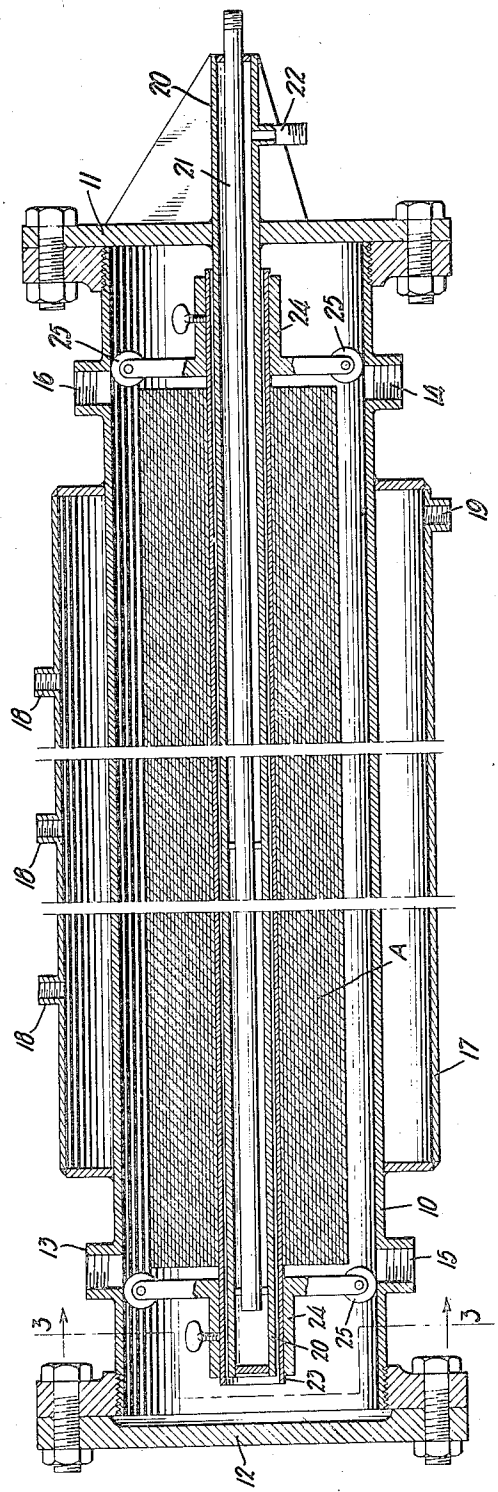


Fig. 2.

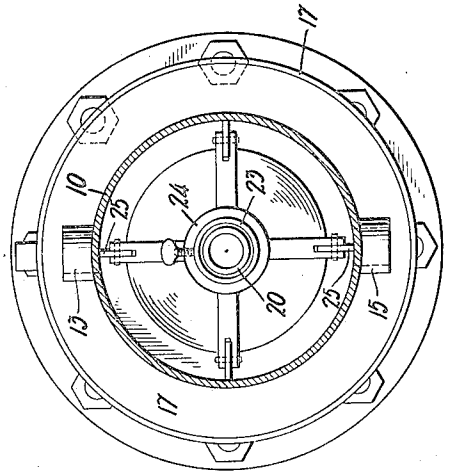


Fig. 3.

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APPARATUS FOR TREATING ROLLED FABRIC

Application filed April 7, 1928. Serial No. 268,351.

In my prior Patent No. 1,665,230, dated April 10, 1928, there is disclosed a process in which certain threads of a wide fabric sheet are of such material that after the completion of the fabric, and the bleaching, washing, dyeing, starching or other finishing operations, these threads may be dissolved out to thereby release, free, or disconnect portions of the fabric sheet from each other. More specifically the patent discloses the connecting of adjacent strips of Levers lace by tie threads of cellulose acetate and the dissolving out of these threads in acetone. This does not affect the structure or finish of the lace strips.

Although my present invention may be utilized for the treatment of rolled fabric with other chemicals, or fluids, and for other purposes, the specific embodiment hereinafter described is intended primarily for the removal of the tie threads from the type of fabric above referred to and disclosed and broadly claimed in said patent.

One object of my invention is to increase the speed with which the material is treated. To secure this object I provide means whereby the fabric is treated in rolled form rather than being conducted as a single layer through a tank as disclosed in said patent.

A further object of the invention is to render the process more economical by preventing loss of the solvent or other treating fluid.

A further object is to secure substantially complete removal of the solvent or other treating fluid from the material and the recovery of said fluid for use on further rolls of material.

A further object is to secure substantially uniform treatment of the material of the entire roll.

A further object is to increase the speed of drying of the treated roll.

Various other objects and advantages will be pointed out hereinafter or will be apparent from a consideration of the preferred embodiment illustrated in the accompanying drawings.

In these drawings:

Fig. 1 is a somewhat diagrammatic representation of the various parts of the apparatus used in carrying out the process;

Fig. 2 is a central longitudinal section through the extractor; and

Fig. 3 is a transverse section on the line 3—3 of Fig. 2.

In the apparatus illustrated the material is treated in an extractor which is of substantially cylindrical form and of such diameter and length as to receive the roll of material, but without leaving undue excess space in addition to that occupied by the roll.

The extractor is shown as including a cylindrical shell 10 with a normally fixed end wall 11 and a removable end wall 12. Adjacent to one end the shell is provided with a liquid inlet 13 and adjacent to the opposite end a liquid outlet 14. In addition there may be provided, if desired, a drain 15 and an overflow or air outlet 16.

Encircling the shell is a steam jacket 17 which may have any desired number of steam inlets 18 along the length thereof and an outlet or drain 19 for water of condensation.

As one important feature of the extractor the fixed wall 11 carries a steam pipe 20 disposed centrally of the shell and of a length approximating the length of the shell. This steam pipe 20 is closed at its inner end and within the steam pipe is an inner pipe 21 terminating adjacent to the closed end, but being itself open at the inner end. Thus steam may be delivered through the pipe 21 to the inner end of the pipe 20, and flow back through the outer pipe to a drain or condensate outlet 22.

The material to be treated is wound as a roll A upon a mandrel 23 of such diameter that it may be slipped over the steam tube 20. The mandrel is not any larger than is necessary to give an easy sliding fit so that there will be free heat transference from the steam pipe 20 to the roll of material which thus encircles the steam pipe.

To relieve the steam pipe of the weight of the roll of material, the mandrel is preferably provided with a pair of detachable spiders 24 which may have rollers 25 at the ends of

the arms thereof to insure the supporting and proper centering of the roll of material.

When it is desired to treat a roll of material the end wall 12 may be removed, the spiders attached to the end of the mandrel, and the latter slid in while telescoping on the steam pipe 20. The end wall 12 may then be replaced and the roll will be sealed within the chamber.

When the roll of material is removed one of the spiders may be left in the chamber to support the free end of the steam pipe 20, although the fixed end wall 11 is preferably provided with reinforcing flanges for increasing the rigidity of the support of the steam pipe.

This extractor shown in Figs. 2 and 3 may be connected up in a system as shown in Fig. 1. In the operation of this system, the successive batches of the treating liquid are caused to circulate in succession through the extractor and thereafter steam is applied to the interior and the exterior of the roll so as to thoroughly dry the material and free it of any residual extracting liquid.

More specifically the apparatus includes a plurality of storage tanks for the extracting liquid, three such tanks 26, 27 and 28 being illustrated.

A pump 29 is connected by suitable piping to the three tanks so that it may draw from any one of them. The separate pipe connections to the tanks have valves 30, 31 and 32 in the branches leading to the distributing pipe 33 and between the latter and the pump there is a valve 34. The pump delivers through a pipe 35 and valve 36 to the inlet 13 of the extractor.

The overflow or air outlet 16 is connected to a pipe 37 having a valve 38 and a chamber 39 provided with a gauge or sight glass 40. The top of the chamber 39 is provided with a return conduit 41 to one of the tanks 26, 27 or 28.

In addition to the storage tanks there is provided a still 42 which may be connected to the pipe 33 through a valve 43 and may deliver its vapors through a pipe 44 to a condenser 45 from which the condensate may return to the pipe 33. The inlet of the pump is also connected to the outlet 14 of the extractor by a pipe 46 having a valve 47.

The operation of this portion of the apparatus may be as follows:

The tank 26 may be filled with fresh or redistilled solvent, the tank 27 with solvent which has once been used, and the tank 28 with a solvent which has twice been used.

After the roll of material has been placed in the extractor, the valves 32, 34, 36 and 38 are opened, and the valves 30, 31, 43 and 47 are closed. The pump is started and will thus draw liquid which has been used in two previous operations from the tank 28 and will deliver the same through the pipe 35 to the extractor at the inlet 13. The extractor will fill up with liquid until there is an overflow through the outlet 16 and pipe 37 into the chamber 39. When liquid shows in the sight glass 40 the valve 34 is closed and the valve 47 is opened. Thereafter the pump will draw liquid from the outlet 14 at one end of the extractor and return it to the inlet 13 at the opposite end. This operation is continued until this liquid has dissolved out all of the cellulose acetate constituting the tie threads. The pump is then stopped and the valves 34 and 43 are opened, the valve 32 having been previously closed. The liquid in the extractor may then drain to the still 42. When the extractor is empty the valves 47, 32 and 43 are closed, the valve 31 is opened and the pump is again started in operation. This time it will draw liquid from the tank 27 which has only been used once before. When the desired level shows in the sight glass 40 the valves 31 and 34 are closed and the valve 47 is opened. The pump will then circulate this liquid and the concentration of the cellulose acetate in the roll is decreased to permit of its recovery and to prevent it from being left in the fibres of the roll during the later evaporation by heat and vacuum.

Then the pump is stopped, the valves 34 and 32 are opened, and the liquid which was previously drawn from the tank 27 is returned to the tank 28. When the extractor is again emptied, the valve 30 is opened and valves 47 and 32 are closed. The pump is started and the chamber is filled with the fresh or redistilled solvent from the tank 26. When the extractor is filled the valve 47 is opened and 34 is closed and the liquid is circulated through the extractor until the last trace of cellulose acetate is removed. When this operation is completed the liquid which had previously been drawn from the tank 26 is returned to the tank 27.

During these extracting operations, the supply of steam to the inner pipe of the extractor and to the steam jacket has been shut off.

As the next portion of the process the residual solvent in the roll of material is driven out by heat and recovered. For this purpose there is illustrated apparatus constructed substantially as follows:

Beyond the valve 36 the extractor inlet 13 is connected by a pipe 48 to a condenser 49, said pipe having a valve 50 which is closed during the operations hereinbefore described. The condenser is provided with a condensate return pipe 51 which connects through a valve 52 to the pipe 33.

The inlet 13 of the extractor is also connected by a pipe 53 to a vacuum pump 54, said pipe having a valve 55 which is closed during the extracting operation. The vacuum pump delivers through a pipe 56 to an expansion chamber 57 and the latter has a

vapor outlet pipe 58 leading to a condenser 59. The condensate from this condenser may flow through a valved pipe 60 to a combined vacuum receiver and still 61, and the expansion tank 57 is also connected to this same receiver and still by a valved pipe 62. The still has a valve controlled drainage pipe 63 and a vapor outlet pipe 64 leading past a valve 65 to the condenser 49.

The operation of this portion of the apparatus may be substantially as follows:

After the last charge of treating liquid has been withdrawn from the extractor, the valves 65, 55, 36, 38 and 47 are closed, while the valves 50, 52, and 30 are opened. Steam is delivered to the inner pipe and the jacket so as to vaporize the major portion of the solvent remaining in the roll of fabric, and the vapors pass out through the pipe 48 to the condenser 49, and the recovered solvent goes back to the tank 26.

When the major portion of the solvent has been driven off, the valve 50 is closed, the valve 55 is opened, and the vacuum pump 54 is started.

The reduction in pressure in the extractor and the heating effect of the steam removes substantially all of the remaining solvent.

The vapors from the vacuum pump are delivered to the expansion tank 57 and such portions as condense will go to the still 61 through the pipe 62, and such as do not condense will pass through the pipe 58 to the condenser 59 and thence to the still 61.

When substantially all of the solvent has thus been removed, the vacuum pump may be stopped, the valve 55 is closed, and cold water delivered through the steam pipe to the center pipe 20 and to the jacket 17.

When the roll has thus been quickly cooled, the end plate 12 may be removed and the roll of material drawn out.

If the roll be of such material as is shown in my previous patent above referred to, the separate strips will fall apart as the material is unrolled from the mandrel.

At any suitable time and when a sufficient amount of the solvent has collected in the still 61, the pipes 60 and 62 may be closed, the valve 65 opened and the still heated to vaporize the solvent and deliver it through the condenser 49 to the tank 26. Any residuum may later be withdrawn from the still through the pipe 63.

At any suitable time in the progress of the process the material which has been used in the extractor three times and returned to the still 42 after the third time, may be redistilled, the valve 43 being closed and the condensate being conducted through the pipe 33 to the storage tank 26.

The residuum in the still 42 will contain substantially all of the cellulose acetate or other material which has been removed by the solvent action, and may be drawn off for any desired further treatment after the main portion of the solvent has been distilled off. Thus there will be no loss of solvent in the process, except such small amounts as are withdrawn from the still from time to time with the concentrated cellulose acetate.

The extracting is accomplished very efficiently and with the minimum amount of extracting liquid as the initial extraction is by liquid which has been used before, and the final extraction is by the pure solvent.

It is not necessary to do any redistilling until after the solvent has been used the desired number of times.

By means of the process, a roll of dry material as it comes from the previous manufacturing operations, is inserted in the extractor, and thereafter it is merely a case of valve manipulation until the process is completed, and the dry roll withdrawn ready to be unrolled, and finished and separated strips inspected and prepared for shipment.

It will, of course, be understood that the apparatus above described is only diagrammatically illustrated in the drawings, and that various other arrangements of piping, valves and other parts of the apparatus may be used instead of the particular arrangement illustrated. Also a lesser or greater number of storage tanks may be employed depending upon the number of treatments to be given the material, and also that in some processes where the solvent is of comparatively small value or highly volatile, the vacuum pump and associated parts might be entirely omitted. The extractor illustrated is designed to carry only a single roll of material, although in practice it is preferable that a plurality of extractors be connected in series or that there be a plurality of the inner heating pipes 20 to receive a plurality of rolls in a single extracting chamber.

These are only a few of the various changes which may be made within the scope of my invention as defined in the appended claims.

Having thus described my invention, what I claim as new and desire to secure by Letters Patent is:

1. An apparatus for the treatment of sheet material in roll form, including a chamber having a pipe extending into the chamber from one end, a closure at the opposite end whereby said roll may be moved endwise into said chamber and encircle said pipe, and means for applying a heating medium to the exterior of the chamber and to the interior of the pipe.

2. An apparatus for treating a roll of sheet material, including a chamber having a removable end wall, a pipe projecting into said chamber from the opposite wall, whereby the roll of material may be moved endwise onto said pipe and encircle the latter, and means for delivering a heating medium to said pipe, whereby the roll is heated from the inside.

3. An apparatus for treating a roll of sheet material, including a chamber having a removable end wall, a pipe projecting into said chamber from the opposite wall, whereby the roll of material may be moved endwise onto said pipe and encircle the latter, and means for delivering a heating medium to said pipe, whereby the roll is heated from the inside, and said chamber having an outside steam jacket, whereby the roll may be simultaneously heated from the outside.

4. An apparatus for treating a roll of sheet material, including a chamber having a pipe extending into said chamber from one wall thereof, a mandrel adapted to carry the roll of material and to telescope with said pipe, and means for supporting said mandrel from the wall of the chamber independently of said pipe.

5. An apparatus for treating a roll of material, including a chamber having a pipe projecting thereinto, a mandrel adapted to carry the roll of material to be treated and to telescope on said pipe, and spiders secured to opposite ends of said mandrel for engaging with the wall of the chamber to support the mandrel.

6. An apparatus for treating sheet material in roll form, including a chamber having an inlet and an outlet adjacent to opposite ends, means within said chamber for holding the roll stationary and out of contact with the walls of the chamber, a liquid storage tank, a pump for delivering liquid from said storage tank to said inlet, a conduit connecting said outlet to the inlet of the pump, whereby said pump may be used for filling the chamber and for circulating liquid through said chamber, and a separate conduit connecting the top of said chamber and said tank for the return of excess liquid to said tank after filling of said chamber.

7. An apparatus for treating textile material, including a treating chamber, a tank at a lower level, a pump, valved pipe connections between the inlet of the pump and both said chamber and said tank whereby the pump may draw from either or the chamber may drain to the tank, pipe connections from the outlet of said pump to said tank whereby the pump may circulate the liquid through the chamber or fill the chamber from the tank, and overflow pipe connections from the top of the chamber and independent of the previously mentioned pipe connections for return of excess liquid from the chamber to the tank after the completion of the filling of the latter.

Signed at Stamford, in the county of Fairfield and State of Connecticut, this 5th day of April, A. D. 1928.

JOHN SPALDING.