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H. VON KOHORN ET AL

2,570,171

DEAERATION APPARATUS

Filed Jan. 23, 1946

2 Sheets-Sheet 1

Fig. 1A

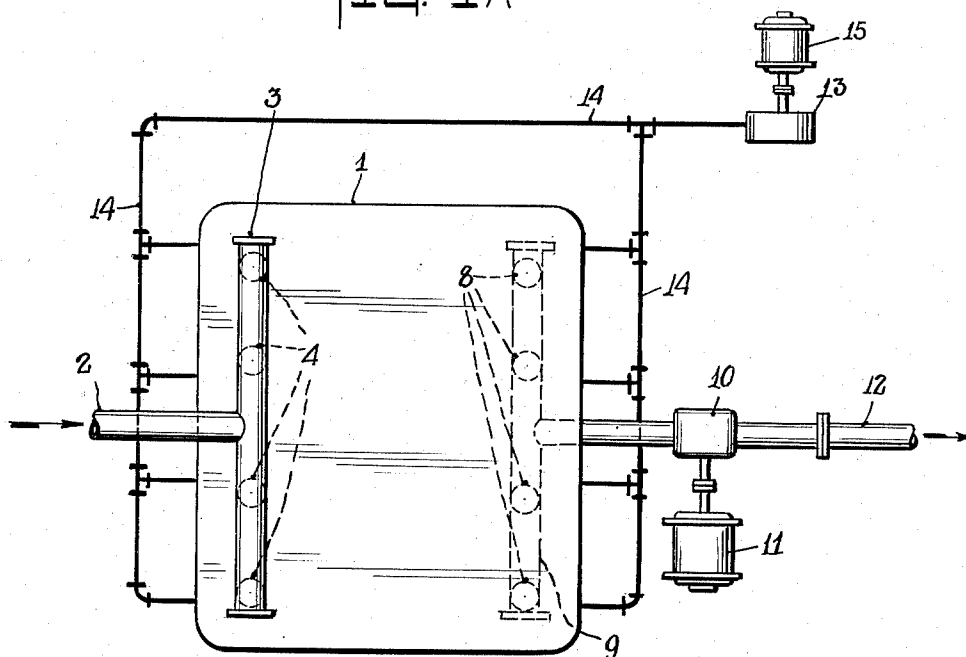
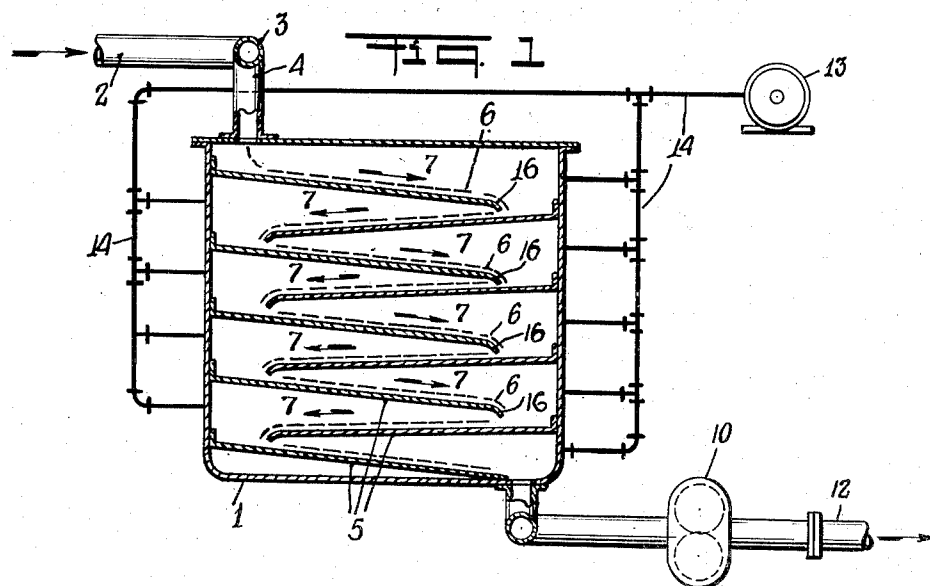


Fig. 1



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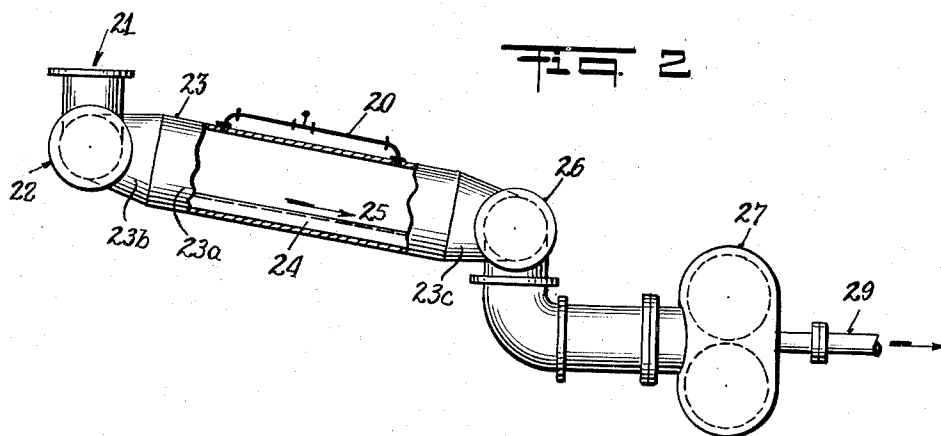
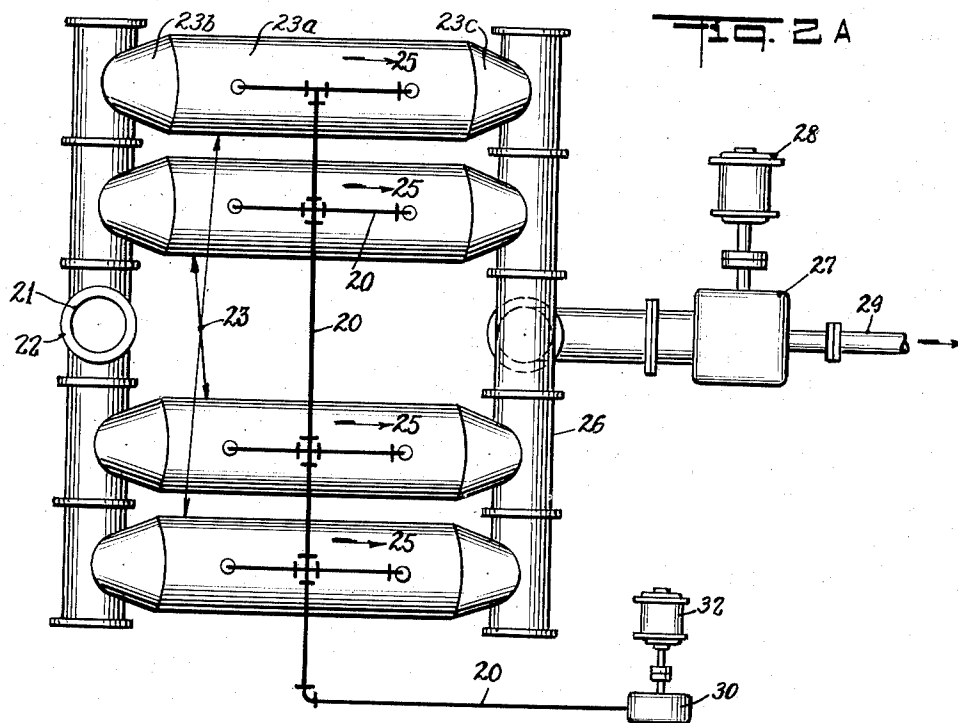
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2 Sheets-Sheet 2



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DEAERATION APPARATUS

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Our invention pertains to a method and apparatus for the continuous manufacture of rayon, staple fiber, transparent cellulose sheeting, and other cellulose derivatives, by the viscose method. Our invention eliminates the batch method commonly employed in the manufacture of viscose, and results in a saving of time, space, labor, and investment.

According to our invention, we place purified cellulose, such as wood pulp of rayon grade, or bleached cotton linters, on an endless conveyor belt, or other conveying means. While on such conveying means, the cellulosic raw material is first subjected to the normal steeping process or mercerizing, as practised by persons skilled in the art. We then subject the alkali cellulose thus formed to pressure, such as between squeeze rollers, in order to extract excess caustic soda solution, alkali cellulose of known nature resulting from said extracting action. We then subject the alkali cellulose to a shredding or disintegrating action, either by passing it through a continuous shredder, or by chopping it while traveling on an endless belt or conveyor.

After such shredding, disintegrating or chopping action, we heat the alkali cellulose while continuously traveling on conveyor means, thereafter cooling the alkali cellulose to a point where the alkali cellulose, thus aged, is ready for sulfidizing with carbon bisulfide. This method of ageing, known as short-ageing, has been described in U. S. Patent No. 2,218,836.

As an alternative, we first mercerize, then heat, then extract, in the order set forth, leaving the order of the other steps unchanged, except that the cooling may take place before or after the extracting step. This alternative has the additional advantage of permitting dissolved hemi- and oxy-celluloses, contained or created in the heated alkali cellulose, to be extracted by pressure together with the excess caustic soda solution, thus reducing undesirable components of the alkali cellulose.

When describing the preferred sequences of operations according to our process, we do not wish to be limited to the precisely defined time cycles. Certain herein described steps particularly the heating and to some extent the cooling step, may overlap the time cycle of other steps or take place concurrently with them. Thus, for example, heating may start during mercerizing, even though the mercerizing step itself may just be commencing or may not yet be completed. Cooling may commence during extraction or shredding, and may overlap the first stage of the

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sulfidizing step. We select the exact order of steps in accordance with the nature of the cellulose material used, and the properties of the viscose desired, provided always, however, that the alkali cellulose, if heated, must be cooled sufficiently and in time to avoid danger of explosion during the sulfidizing step, and prior to dissolving.

While the alkali cellulose is still traveling on the continuous conveying means, we treat the same with carbon bisulfide, and we preferably carry out this step while the endless conveying means are enclosed in a housing in order to prevent carbon bisulfide fumes from escaping. At the same time, we gently agitate or vibrate the endless conveying means in order to assure complete and thorough action of the carbon bisulfide on the alkali cellulose, forming xanthate, as now practised by persons skilled in the art.

We thereafter continuously feed the xanthate into a mixing tank, feeding at the same time caustic soda solution to result in viscose of normal consistency and analysis, as practised by persons skilled in the art.

Our mixing or dissolving tank is constructed in such a way as to feed xanthate and caustic soda solution at one end, and to discharge the viscose at the other end, in continuous fashion.

The viscose obtained in continuous manner as described above, is then pumped or forced by compressed air, and still in continuous manner, into and through a series of pipes or other tanks in order to give the viscose an opportunity to ripen to the desired degree, depending on the type of product desired. Intermittently, or at one stage of this operation, the viscose is forced through a filter medium, in order to remove, still in a continuous manner, any undissolved particles contained in the viscose. After the desired degree of filtration and ripening has been obtained, the viscose is fed into a vessel which is subjected to a partial vacuum. While slowly and in continuous manner passing through this vessel, or large pipes, the viscose is thus de-aerated, and is now ready for the spinning, casting, or other coagulation and precipitating steps.

Our method of continuously de-aerating viscose permits the viscose to be subjected to a partial vacuum in such a manner as to present the largest possible surface and the least depth through which air or gas must rise through the viscose in order to be absorbed by the vacuum. According to our method, the viscose is permitted to spread out horizontally in suitably designed vessels or pipes, thus presenting a large, hori-

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zontal, aggregate surface area to the partial vacuum, and at the same time, reducing the vertical depth or layer of viscose at each particular point. We achieve this by feeding the viscose into a tank equipped with a series of inclined splash or baffle boards, along which the viscose is permitted to flow in a thin layer, said splash or baffle boards being of suitable length, width, and inclination. After deaeration, we collect the viscose again in suitable pipes of usual diameter.

In the drawings, Figure 1 illustrates one embodiment of the vessel used for this purpose. Figure 2 shows a series of pipes through which the viscose is conducted, resulting in a similar effect. The apparatus illustrated can also be used for the removal of air or other gases from solutions other than viscose.

The viscose is fed into the tank shown in Figure 1, or into the pipes shown in Figure 2, at the top, either by gravity, or by means of pumps. It is removed from the tank or the pipes at the bottom, by means of gravity or pumps, and from there transported into intermediary vessels, through additional filters, or to the extruding mechanism.

Figure 1 shows a side elevation and Figure 1A shows a plan view of an apparatus for the continuous deaeration of viscose and other solutions, comprising a closed housing 1, the cross-section of said housing being a multiple of the cross-section of the feed pipe 2 for the solution. The solution enters the apparatus through feed pipe 2, inlet header 3, and is distributed by inlet pipes 4. The viscose passes over interior deflecting members 5, having a large aggregate surface and an inclined position so as to permit the solution 6 flowing by gravity and in a controlled path from the top to the bottom of said housing 1, to spread out over a large area. The direction of flow is indicated by the arrows 7. Vacuum pipe connections 14 are mounted on housing 1, permitting the exposure of all of said interior members and of the solution to less-than-atmospheric pressure. Outlet pipes 8, outlet header 9, gear pump 10 (driven by motor 11), and outlet pipe 12, represent means for discharging, collecting and removing said solution from the lower part of the housing. Vacuum lines 14, are connected to vacuum pump 13, driven by motor 15. Deflecting members 5 are mounted in such a way that the lower end of each sheet 5 closely approaches the sheet underneath in order to prevent the liquid from dripping over a considerable height so as to prevent the formation of air bubbles.

Referring now to Figures 2 and 2a of the drawings which illustrate another embodiment of the present invention and wherein Figure 2 is a side elevational view thereof and Figure 2a is a top plan view there is provided a horizontal inlet manifold 22 and a horizontal outlet manifold 26 which is parallel to and spaced laterally from and below the inlet manifold 22. A plurality of inclined tubular conduits 23 of circular cross-section connect and provide communication between the manifolds 22 and 26 and include a major intermediate zone 23a of substantially constant cross-section and coaxially aligned inlet and outlet end zones 23b and 23c respectively. The end zone 23b provides communication between the inlet manifold 22 and the intermediate zone 23a and also provides an outwardly tapering entrance to the intermediate zone 23a of increasing cross-section from the manifold 22 to the intermediate zone 23a. Similarly the end zone 23c provides communication between the outlet manifold 26 and the intermediate zone 23a providing an inwardly

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tapering exit from the intermediate zone 23a and being of decreasing cross-section from the intermediate zone 23a to the outlet manifold 26. The manifold 22 is provided with an inlet pipe 21 whereas the outlet manifold 26 is connected by way of suitable piping to the inlet of a gear pump 27 driven by a motor 28. The output of the pump 27 discharges through a pipe 29. Furthermore each of the conduits 23 is connected by way of vacuum lines 20 to a suitable vacuum pump 30 which is driven by a motor 32.

In operation a liquid to be de-aerated such as viscose is fed to the inlet manifold 22 through the pipe 21 and is there distributed to the conduits 23. In passing through the inlet end zones 23b the fluid spreads into a relatively shallow stream and as such flows by gravity downwardly through the intermediate zone 23a in the direction of the arrow 25. The fluid then flows through the end zones 23c into the manifold 26 from where it is removed by the pump 27. The fluid in its passage along to conduits 23 is subjected to sub-atmospheric pressure where de-aeration occurs. This de-aeration is accelerated as a result of the small depth of the fluid stream as it flows along the conduits 23.

When using an intermediary tank, we place the same under pressure, regulating the level of the viscose in said tank, so as to leave an empty space at the top of the tank. The viscose is forced into said tank by means of a pump or other means, which exert sufficiently strong pressure to force the viscose into the above-described pressure-chamber, thereby overcoming the pressure prevailing in it. The pressure chamber or tank has an outlet at the bottom, and the viscose in the tank is forced through said outlet. Thus, while viscose is continuously fed into the pressure chamber against the pressure prevailing in it, viscose is also continuously and simultaneously forced out of the pressure chamber by these same pressures. In addition to the pressure described above, the viscose can also be transported by pumps from this vessel in continuous manner into the spinnerettes, casting device, or other extruding mechanism which delivers the viscose into a setting bath, as practised by persons skilled in the art of making rayon, staple fiber, transparent cellulose sheeting, or other cellulose derivatives of the viscose type.

Whereas the chemical operations as such are the same as those now practised in the viscose products industry, our method of continuously performing said known operations without the use of batches at any stage, is new.

We have explained the principle and mode of operation of our invention and have described embodiments thereof. However, we desire it understood that, within the scope of the appended claims, the invention may be practised otherwise than as specifically illustrated and described.

What we claim is:

1. Apparatus for the de-aeration of viscose or the like, comprising a pair of manifolds relatively disposed in vertically and horizontally offset positions, a plurality of tubular conduits connecting said manifolds with each conduit sloping downwardly and each having a major intermediate zone of constant cross-section and end zones connecting the intermediate zone with the respective manifolds, each end zone being of relatively short length and axially aligned with the intermediate zone axis, the cross-sectional area of each end zone decreasing in the direction of the manifold to which it is connected to there-

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by form a tapering entrance and exit for the intermediate zone, whereby the entering material for the intermediate zone is spread by the entering tapered zone to provide a content of relatively small depth to thereby traverse the major zone under substantially uniform cross section stream form with the depth of the stream determined by the tapered exit zone leading to the lower manifold, each conduit having a substantially greater transverse cross-sectional area than a similar area of the upper manifold, and means for producing a sub-atmospheric pressure in said conduits.

2. Apparatus as in claim 1 characterized in that each conduit cross sectionally is of circular contour to thereby present a cross section of the content of the intermediate zone as having the contour of the segment of a circle.

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RALPH S. VON KOHORN. 20

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