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APPARATUS FOR DEHYDRATING VISCOSE PRODUCTS

Filed May 1, 1926

FIG. I.

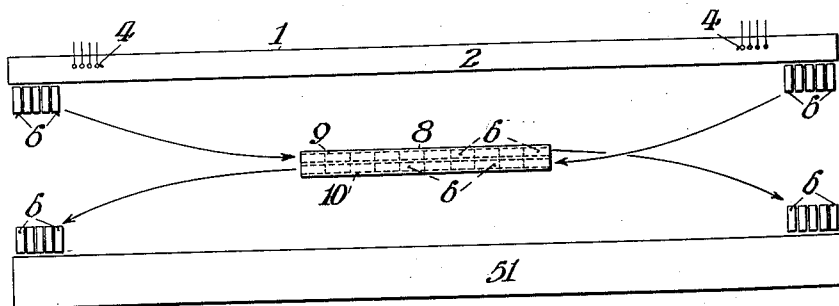


FIG. II.

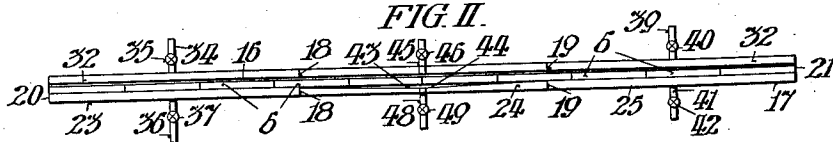


FIG. III.

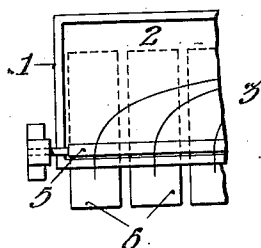


FIG. IV.

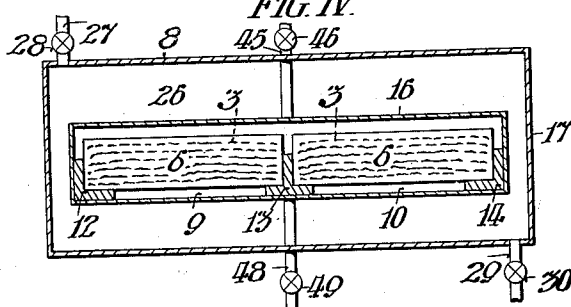
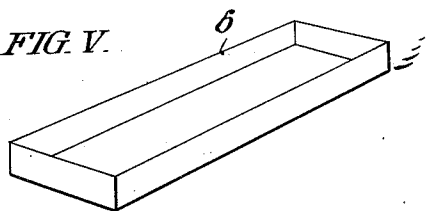


FIG. V.



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APPARATUS FOR DEHYDRATING VISCOSE PRODUCTS.

Application filed May 1, 1926. Serial No. 105,945.

My invention relates to the manufacture of filaments by projecting viscose (variously known as cellulose sulphocarbonate or thio-carbonate) through orifices into a coagulating medium, for instance, a bath containing chemicals in aqueous solution which coagulate the viscose as a semisolid impure cellulose hydrate. However, this invention is applicable to films which may be formed in any convenient manner, for instance, by pouring viscose upon a flat level surface and subjecting the same to the action of a coagulating medium.

Such viscose products are gelatinous and initially so soft and impressionable that they may be marred by handling and must be dehydrated and desiccated to render them firm enough in texture for commercial use. A very considerable portion of the cost of manufacture of such filaments and films is incurred in the ordinary process of eliminating the surplus moisture therefrom, which is effected by exposure to air either at, or above, atmospheric temperatures. Such desiccation is costly because of the length of time required to effect it, during which the viscose products must be supported in such position and relation as not to be marred by contact with each other, or otherwise. In other words, a vast extent of costly storage space and means must be employed to effect such ordinary dehydrating operations.

I have discovered that such viscose products may be almost instantaneously dehydrated to such a degree as to resist the stresses to which they are initially subjected in winding or otherwise disposing of them, immediately upon their emergence from the coagulating medium aforesaid, if they are then subjected to the dehydrating effect of an alcoholic environment, and preferably by surrounding them with an atmosphere of warm alcoholic vapor. That is to say, such viscose products may be dehydrated with far greater rapidity and at less cost by subjecting them to the action of alcohol than by subjecting them to the action of atmospheric air or any other desiccating medium heretofore employed, and I find that the dehydrating effect of alcohol upon such products is much more rapid if the alcohol is in gaseous form than if it is in liquid form.

My invention includes the various novel features of construction, arrangement and procedure herein set forth, but the process

herein disclosed is claimed in my copending application Serial No. 105,944 filed May 1, 1926, for Letters Patent of the United States.

In said drawings;

Fig. I is a plan view of apparatus conveniently embodying my improvement.

Fig. II is a longitudinal sectional view of the dehydrating apparatus indicated in Fig. I.

Fig. III is a fragmentary plan view, showing the left hand end of the viscose precipitating tank and its appurtenances, indicated in Fig. I, but on a larger scale.

Fig. IV is a transverse sectional view of said dehydrating apparatus shown in Figs. I and II, but on a larger scale.

Fig. V is a perspective view of one of the trays in which the viscose filaments are deposited when ejected from the precipitating tank indicated in Fig. I and in which they are transported through the dehydrating apparatus aforesaid to the winding mechanism indicated in Fig. I.

Referring to Fig. I, the medium for coagulating the extruded viscose filaments may be conveniently contained in the tank 1 and consist of an aqueous solution 2 containing fourteen per cent of sodium bisulphite and one-fourth of one per cent of tri-sodium phosphate. Such filaments 3 may be extruded into the bath 2 by any convenient means, for instance, by pumps which force the viscose through jet orifices in the spinnerets 4, and may be withdrawn or ejected from said bath by any convenient means. For instance, they may extend over a roller or rollers 5 and drop into trays 6 which are formed of any suitable foraminous material, for instance, perforated sheet Monel metal. Said trays may be shifted back and forth longitudinally, but transversely with respect to the length of said tank 1, by any suitable mechanical means, or by hand; so that, as each filament drops, it is received and coiled both transversely and longitudinally in its respective tray 6, which may be conveniently three inches deep, one foot wide, and three feet long. When said trays 6 are sufficiently charged with filaments 3, they may be removed from said precipitating tank and replaced by empty trays. The filled trays are then successively pushed through the dehydrating apparatus 8 which is what may be termed a "tunnel," conveniently including two parallel passageways 9

and 10 each of such dimensions as to permit the trays to be freely slid longitudinally therethrough. I find it convenient to shift the trays by hand from the left hand end of said tank 1 to the adjacent end of the passageway 9 in the tunnel 8 through which those trays are pushed in succession. Similarly, the filled trays 6 from the right hand end of said tank 1 are shifted to the right hand end of the passageway 10 of said tunnel 8 and pushed therethrough in succession.

Said tunnel 8 includes guide rails 12, 13, and 14 for said trays 6, forming respective passageways 9 and 10 which are inclosed by the walls of the tube 16. Said tube 16 is surrounded by the tube 17 forming jacket spaces between them which are divided by transverse partitions 18 and 19 and provided with end closures 20 and 21, to form three substantially fluid tight compartments 23, 24, and 25.

The intermediate compartment 24 is supplied with a heating medium, such as warm water 26, which may be conveniently circulated therein through the inlet pipe 27 provided with the valve 28, and the outlet pipe 29 provided with the valve 30. Said compartments 23 and 25 are each supplied with a refrigerating medium, conveniently cold water 32. The refrigerant may be circulated through said compartment 23, by way of the inlet pipe 34, controlled by the valve 35, and the outlet pipe 36 controlled by the valve 37. The refrigerant may be circulated through said compartment 25, by way of the inlet pipe 39, controlled by the valve 40, and the outlet pipe 41 controlled by the valve 42.

The wall of said warm intermediate compartment 24 may be slightly depressed beneath the passageways 9 and 10 to form a shallow basin 43 to receive alcohol 44, preferably ethyl hydroxid, C_2H_5OH , which is introduced to said tunnel through the pipe 45 controlled by the valve 46. The warmth of said intermediate section of the tunnel vaporizes said alcohol which percolates through the perforations of said trays 6 and surrounds the convolutions of the filament 3 piled in said trays, with the effect of dehydrating said filaments. Of course, the alcoholic vapors tend to escape longitudinally through said passageways 9 and 10; but the walls of the end sections of said tunnel are maintained at such low temperature, by the refrigerant 32, that such vapors are condensed and gravitate back to said basin 43, where they are again volatilized, by the heat of the medium 26 in the compartment 24. However, I find it convenient to provide said basin 43 with a drain pipe 48 controlled by a valve 49, to permit said passageways 9 and 10 to be cleaned when necessary, by flushing them with water.

The process above described is so economi-

cal that fifty cubic centimeters of liquid alcohol is sufficient to completely dehydrate four dry pounds of the filament.

Said trays 6, discharged from the dehydrating apparatus 8, are shifted to filament winding mechanism represented by the rectangle 51 in Fig. 1, and including individual winding devices for winding the filaments upon spools.

Under some circumstances, I find it preferable to pass the trays 6 through said dehydrating apparatus 8 so rapidly that the filament 3 contents thereof are not completely desiccated during such passage, and to further dehydrate such filaments after they are wound upon said spools and conveniently by apparatus which is the subject matter of my copending application Serial No. 117,365 filed July 21, 1926, for Letters Patent of the United States for improvement in apparatus for dehydrating viscose products.

I do not desire to limit myself to the precise details of construction and arrangement herein set forth, as it is obvious that various modifications may be made therein without departing from the essential features of my invention, as defined in the appended claims.

I claim:

1. In apparatus for dehydrating viscose products; the combination with a tubular casing, forming a passageway extending longitudinally therethrough; of means arranged to heat said passageway intermediate of its length; means to introduce a volatile liquid dehydrating medium to said passageway, at the heated portion thereof; means for refrigerating the opposite ends of said passageway; and means, fitted to slide in said passageway and carry wet viscose products; whereby said products may be caused to traverse said passageway and be dehydrated by a vaporous dehydrating medium intermediate of the length of said passageway, and said medium is conserved by chilling it and condensing it at the ends of said passageway.

2. In apparatus for dehydrating viscose products; the combination with a tubular casing, forming a passageway extending longitudinally therethrough; of casing means outside said first casing, in spaced relation therewith; means dividing the space between said casings in three compartments; means arranged to supply a heating medium to the intermediate compartment; means arranged to introduce a volatile liquid dehydrating medium to said passageway; means for supplying the opposite end compartments with a refrigerant; and means, fitted to slide in said passageway and carry wet viscose products; whereby said products may be caused to traverse said passageway and be dehydrated by a vaporous dehydrating medium intermediate of the length of said passageway, and said medium is conserved by chill-

ing it and condensing it at the ends of said passageway.

3. In apparatus for dehydrating viscose products; the combination with a tubular casing, forming parallel passageways extending longitudinally therethrough; of casing means outside said first casing, in spaced relation therewith; means dividing the space between said casings in compartments; means arranged to supply a heating medium to an intermediate compartment; means arranged to introduce a liquid dehydrating medium to said passageways at said intermediate compartment; means for supplying opposite end compartments with a refrigerant, arranged to condense said dehydrating medium; means arranged to return said condensate to said heated region; and means, fitted to slide in said passageways and carry wet viscose products; whereby said products may be caused to traverse said passageways and be dehydrated by said dehydrating medium intermediate of the length of said passageways, and said medium is conserved by chilling it at the end of said passageways and returning it to the heated region of said passageways.

4. In apparatus for dehydrating viscose products; the combination with a tubular casing, of means in said casing forming parallel passageways extending longitudinally therethrough; casing means outside said first casing, in spaced relation therewith; means dividing the space between said casings in compartments; means arranged to supply a heating medium to an intermediate compartment; means arranged to introduce a volatile liquid dehydrating medium to said passageways at said intermediate compartment; means for supplying opposite end compartments with a refrigerant, arranged to condense said dehydrating medium; and means, fitted to slide in said passageways and carry wet viscose products; whereby said products may be caused to traverse said passageways and be dehydrated by a vaporous dehydrating medium intermediate of the length of said passageways, and said medium conserved by chilling it and condensing it at the end of said passageways and returning it to the heated region of said passageways.

5. In apparatus for dehydrating viscose products; the combination with a tubular

casing, of means in said casing forming parallel passageways extending longitudinally therethrough; casing means outside said first casing, in spaced relation therewith; means dividing the space between said casings in three compartments; a basin at the intermediate compartment; means arranged to supply a heating medium to said intermediate compartment; means arranged to introduce a volatile liquid dehydrating medium to said basin; means for supplying the opposite end compartments with a refrigerant; and means, including foraminous trays, fitted to slide in said passageways and carry wet viscose products; whereby said products may be caused to traverse said passageways and be dehydrated by a vaporous dehydrating medium, and said medium is conserved by chilling it and condensing it and returning it to said basin.

6. In apparatus for dehydrating viscose products; the combination with a tubular casing, of guide rails in said casing forming two parallel passageways extending longitudinally therethrough; another casing, outside said first casing, in spaced relation therewith; means dividing the space between said casings in three compartments; the floor of said passageways over the intermediate compartment being shaped to form a basin; valve controlled means arranged to supply a heating medium to said intermediate compartment; valve controlled means arranged to introduce a volatile liquid dehydrating medium to said intermediate compartment basin; a valve controlled vent pipe leading from said basin; valve controlled means for supplying the opposite end compartments with a refrigerant; and means, including foraminous metallic trays, fitted to slide in said passageways and carry wet viscose products; whereby said products may be caused to traverse said passageways and be dehydrated by a vaporous dehydrating medium intermediate of the length of said passageways, and said medium is conserved by chilling it and condensing it at the end of said passageways and returning it, by gravitation, to said basin.

In testimony whereof, I have hereunto signed my name at Burlington, New Jersey, this 27th day of April, 1926.

SAMUEL A. NEIDICH.