

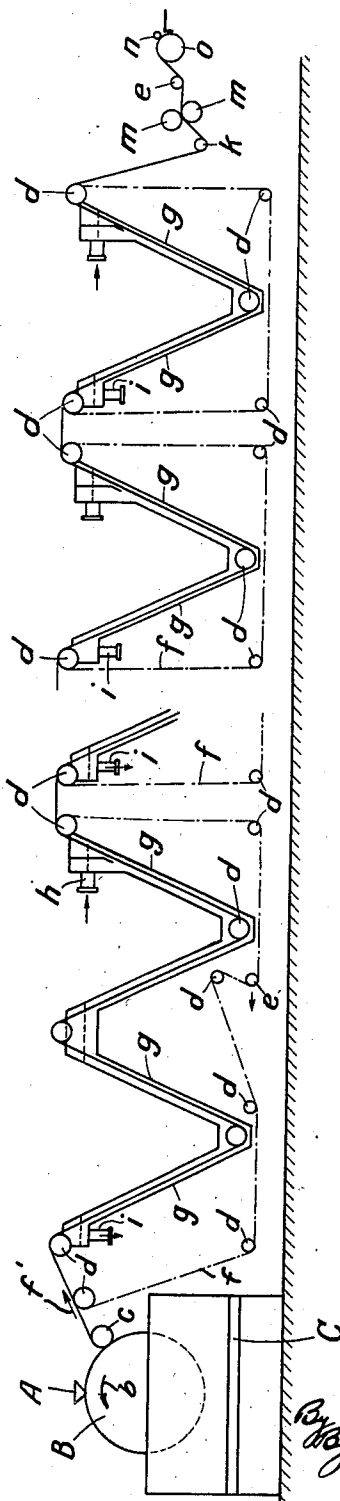
Feb. 25, 1930.

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1,748,868

APPARATUS FOR THE MANUFACTURE OF FILMS FROM CELLULOSE SOLUTIONS

Filed May 7, 1928



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UNITED STATES PATENT OFFICE

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APPARATUS FOR THE MANUFACTURE OF FILMS FROM CELLULOSE SOLUTIONS

Application filed May 7, 1928, Serial No. 275,903, and in Germany May 10, 1927.

My invention relates to apparatus for the manufacture of thin sheets or films from cellulose solutions and more particularly to an apparatus comprising a series of successive vats and means for conducting a web successively through all of the said vats for purposes to be explained more in detail hereinafter.

In the manufacture of films from cellulose solutions as hitherto practiced, a thin layer of cellulose solution spread over and upon a smooth surface to form a film, is first treated with a so-called precipitating agent for coagulating purposes and the coherent film or web produced by such treatment is subsequently subjected to the action of several solutions or liquors to be applied in succession for hardening, washing, bleaching and dyeing purposes. These successive operations cannot be carried out except by moving the coagulated film or web a long way through several vessels containing the treating liquors and the difficulties arising therefrom are the more aggravating in cases where very thin films are to be manufactured such as used for wrapping purposes, for instance for wrapping card-board boxes containing chocolate cakes, sweets, candy and the like. Thin films of this kind possess, when in moist condition, a comparatively low degree of firmness only, so that it is very difficult and requires skilled operators and exceedingly careful handling to move the fragile film through the several liquors or baths constituting, in their totality, a long way, without thereby damaging the same. Furthermore, the art as hitherto practised entails the use of excessive quantities of treating liquids for performing the several operations hereinbefore mentioned, and is objectionable on account of the inconveniences arising therefrom.

The object of my invention is to remedy these defects and with this object in view I move the films through the baths on a path of the hill-and-valley type constituted by endless supporting bands caused to pass through the vessels containing the treating liquors or baths, and I preferably construct and shape the said vessels accordingly to form low or

narrow case-like containers assembled, in each group or row, to constitute a down-and-up vat. The latter may be composed of two, four or still more case-like members which are so interconnected in each group as to be in communication with each other and allow the liquid to flow from one member to the adjacent member or members associated therewith to form my particular vat structure.

The endless band running through such a vat, composed of inclined or slanting case-like members, affords a safe support to the film on its way through the vat, both the band and the film supported by the band travelling downwards and upwards once or several times, as required or preferred, so as to take a hill-and-valley course. As the low, narrow cases or chests require a comparatively small amount of liquid only in order to be properly filled, the hardening, bleaching and all the other operations can be carried out in a very economical manner and further as the cases or members, constituting the vats, are arranged in inclined position with relation to each other and to the ground, the circulation of the liquid through the vat members can be controlled and regulated in a ready way.

I will now proceed to describe my invention more in detail in connection with the embodiment thereof illustrated diagrammatically on the accompanying drawing.

In the drawing A designates a viscose casting device for pouring the viscose onto a drum B to form a thin layer or film thereon. The drum B is mounted on suitable bearings (not shown) so as to be free to revolve in a vessel C containing a coagulating liquor, the level of which is sufficiently high to permanently have the drum partially immersed in the liquor.

As the drum B continues to revolve in the direction of the arrow *b*, the film produced thereon and coagulated by the action of the liquor in the vessel C, passes by and about a receiving roller *c* onto an endless band *f* travelling in the direction of the arrow *f'* and running over a system of guiding rollers *d* and *e* arranged without and within the first

vat composed of four low, narrow cases *g* duly assembled to form a W-shaped vat structure. It will be seen that the film while adhering to the guiding band *f* travels in a zig-zag course or down and up through the vat forming a hill-and-valley structure. The cases *g* are inclined with relation to each other and interconnected to form a group or vat unit in which the liquid is free to circulate from one case *g* into the other cases of the group.

In the embodiment shown several groups or vats of different configuration are illustrated, the first group or vat comprising, as hereinbefore described, four inclined cases *g* assembled and interconnected to form a unit or vat of W-like cross-section, and the following two groups of the apparatus comprising each two inclined cases *g* only similarly united to form a unit or vat of a V-like cross-section. It goes without saying that each individual group or vat is equipped with a guiding mechanism of its own including a system of guiding rollers *d* and *e* and an endless band *f* travelling over the rollers. The endless bands are moved each by a separate driving mechanism (not shown).

Obviously a group of cases, or in other words, a vat, is to be provided in the apparatus for each operation or treatment to which the film is to be subjected for hardening, washing, bleaching purposes and so on, so that the apparatus will comprise as many groups of cases or vats as there are operations required, and each group of cases or vat will be filled with a liquor or liquid of the character for which it is destined, such as a hardening liquor, a bleaching liquid and the like. Each group of cases *g* is provided with an inlet *h* for the admission of the liquor and an outlet *i* for the discharge thereof. Preferably I locate the inlet *h* at a point farthest remote from the vessel C and the outlet *i* at a point nearest to the latter, as will be clearly seen in the illustrated embodiment.

In operation the film produced on the drum B in the vessel C is guided in succession to and over the several successive endless bands *f* so as to travel therewith through the vats constituting the apparatus. Simultaneously therewith the several different liquids required for the purposes aimed at, are caused to flow through the vats by injecting the same into the inlets *h* and allowing the same to flow off from the outlets *i*, so that the several liquors will flow through the vats in countercurrent direction with relation to the travel of the film. The finished film is withdrawn from the last group of cases or vat by means of a guiding roller *k*, and passes between the rolls *m*, *m* of a suitable press whence it is conveyed by means of another guiding roller *l* to a winding device *n*, *o* in order to be wound up into a cylindrical roll while still in moist condition.

The passage of the liquors flowing through the several groups or cases or vats may be controlled and adjusted by adequately regulating the level of the liquid columns in the vats.

What I claim is:—

1. An apparatus for manufacturing thin sheets or films from cellulose solutions, including a film producing device, a conveying band arranged to travel in a successively reversely inclined path and carrying the film, and a vat composed of a group of sections comprising relatively flat cases arranged in inclined juxtaposition and relatively closely embracing said band and the film carried thereby and substantially following the course of travel thereof, said cases being connected for intercommunication, whereby said film may be subjected to a liquid bath throughout substantially the full extent of its travel.

2. An apparatus for manufacturing thin sheets or films from cellulose solutions, comprising a film producing device, a plurality of vats, each composed of a group of sections, each section comprising a flat shallow case and said sections arranged in inclined juxtaposition and connected so as to ensure intercommunication, and a separate endless film conveying band in connection with each vat or group adapted to travel through all of the cases of the group.

3. An apparatus for manufacturing thin sheets or films from cellulose solution, including a film producing device, a plurality of vats, each vat composed of a group of sections comprising flat shallow cases arranged in inclined juxtaposition and connected for intercommunication, a separate endless film conveyor in connection with each vat and adapted to travel through all of the members of the vat, an inlet provided in each vat at a point farthest remote from the film producing device, and an outlet provided in each vat at a point nearest to the said device, said inlet and outlet furnishing means whereby a treating liquor may be circulated in each vat counter-current to the travel of said film.

In testimony whereof, I affix my signature.
HEINRICH DETHLOFF.