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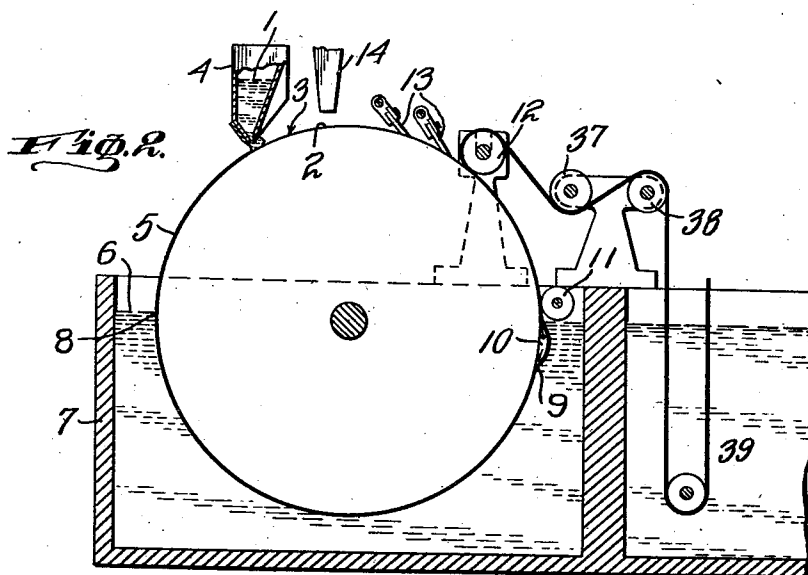
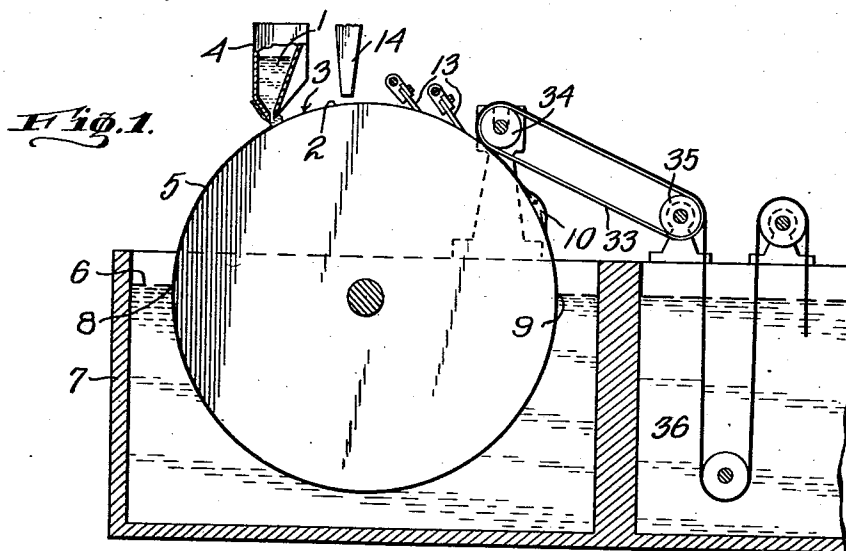
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PROCESS FOR MAKING CELLULOSE SHEETS

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2 Sheets-Sheet 1



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PROCESS FOR MAKING CELLULOSE SHEETS

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10 Claims. (Cl. 18—57)

This invention relates to the production of improved cellulose sheets, films or the like as new articles of manufacture, the processes of making the same and the machines or devices for carrying out such processes.

Among the objects of the present invention, it is aimed to provide an improved cellulose sheet, film or the like of an exceedingly uniform physical structure throughout having a practically equal tension and shrinkage characteristic in length as well as in width.

It is still another object of the present invention to provide an improved cellulose sheet, film or the like of an exceedingly slight thickness as an instance having a weight per thousand square inches of less than 0.40 ounce without striations and the like and having a width of forty inches or more by means of a continuously operating process.

It is still another object of the present invention to provide an improved cellulose sheet, film or the like of unusual thickness with an exceedingly uniform physical structure throughout.

It is still another object of the present invention to provide improved processes for producing the aforesaid improved cellulose sheets, films and the like and to provide improved devices for carrying out such processes.

These and other features, capabilities and advantages of the invention will appear from the subjoined detail description of specific embodiments including the article, processes for making the article and machines for carrying out the processes illustrated in the accompanying drawings in which

Figure 1 is a section of one embodiment more or less diagrammatically shown;

Fig. 2 is a section of another embodiment more or less diagrammatically shown;

Fig. 3 is a fragmental end elevation of a stripping device used in these embodiments; and

Fig. 4 is a fragmental section of the stripping device shown in Fig. 3.

To carry out this invention a pouring base is used upon which a cellulose solution in the form of a layer is spread. The layer becomes solidified as the result of immersing the base into a coagulation liquid.

The essential novelty and the advancement achieved resides in the fact that not only is the coagulation of the layer carried out on the base but a part of the subsequent regeneration of the coagulated strip is also so carried out on the base and, at least, long enough so that the strip will

become sufficiently solidified so that it cannot be stretched and deformed thereafter. This constitutes an important step in the present invention since it has been found in practice that, especially when it is desired to produce layers of exceedingly slight thickness, they cannot be readily detached from a supporting surface without deforming or impairing the same by the forces resulting from the tension of the film layer in the ensuing baths.

In order to eliminate such deleterious effects on the film, this invention aims to provide a device which enables introducing a coagulation solution under the strip and to wet the base during the process to aid in the regeneration reaction. When the coagulation treatment is so controlled that the layer is detached from the original supporting base by the moistened edge of a stripping device and guided over said device while the inner face of the layer is thereby moistened by the coagulating liquid and is again returned to the base, then the layer will solidify into a self-sustaining condition while effectively supported and is thereby protected against being stretched, extended or shrunk until it has sufficiently solidified into a self-sustaining condition where it can no longer be objectionably stretched, extended or shrunk by the aforementioned forces.

In the process, constituting the invention in part, a thick liquid 1 of cellulose solution, for instance viscose, is spread upon the surface 2 of a pouring base 3 by means of a pouring device 4. By moving or rotating the pouring base 3 the so spread cellulose layer 5 passes into a suitable coagulation liquid 6 provided in the container or trough 7.

The character of the liquid 6 depends upon the cellulose solution being used. For viscose a sulphuric acid bath with a supplementary agent of sodium, ammonia, or a similar sulphate is chosen as the coagulation and regeneration liquid. The strength of the solution must be chosen to correspond to the effect desired as is hereinafter set forth.

In accordance with the present invention, the coagulation of the layer 5 starts while the layer passes the point 8 on the surface 2 where the layer 5 on the base enters the coagulation bath. The velocity of the movement of the base 3 and the concentration of the liquid 6 is of such a character, that the coagulation is completed before it passes the point indicated as 9 in Fig. 1.

After the layer 5 is coagulated to a strip which is still soft and delicate, the regeneration of the

strip and its solidification begins. After this coagulation has so taken place, the coagulation liquid 6 starts wetting the surface 2 which was dry until now by diffusing through the strip 5.

The start of the regeneration process is aided by passing fresh coagulation solution onto the lower side of the strip 5 between the strip 5 and the surface 2 by means of the stripping device 10 which will hereinafter be set forth in detail. This device 10 takes the place of the surface 2 for a short time as the strip 5 slides over it while the device 10 moistens the lower side of the strip 5 as well as the surface 2 of the base 3 during this short period.

Beyond the device 10, the strip again passes onto the surface 2 and while so spread on it may thus be moistened with a fresh coagulation fluid and regenerated without being stretched, extended or shrunk, as a result of which, layers of exceedingly slight thickness, as an instance having a weight per square inch of less than 0.40 ounce, may be predetermined.

The device 10 while not necessarily positioned above the level of the bath 6 is so illustrated in Fig. 1 as exemplifying one embodiment of the invention, but at least should be positioned at a point where the coagulation fluid begins to penetrate the strip or layer 5 to the surface 2.

If necessary the roller 11, as shown in Fig. 2 may be provided to guide the strip 5 as it passes from the device 10 back to the surface 2.

The strip 5 which by now should be coagulated sufficiently so that it cannot be deformed any more, is then removed with the aid of the roller 12. As the surface 2 has been moistened with coagulation fluid at least at the point 9, and fresh coagulation fluid supplied to the surface 2, the removal of the strip 5 at the roller 12 will take place very easily and safely, particularly as compared to the processes heretofore known. Consequently, there is no danger of the strip sticking to the surface 2 nor in being impaired or injured when being removed from the surface 2.

The moisture which remains on the surface 2 after the removal of the strip, is wiped off by scraping means, such as the pivotally mounted scrapers 13 so that the surface 2 will be dry again after passing such scrapers 13. As a special precaution effectively to dry this surface 2, before returning to the nozzle 4, the remaining moisture if any may be wiped off or evaporated by warm air supplied by the blower 14.

After the strip 5 is removed by the roller 12, it is passed through different treatment baths, washed and the like and finally dried. The device 10 shown in Figs. 3 and 4 comprises a main body 21 which is pivotally mounted on the shaft 22 or the like. At the end of this main body 21 which is removed from its pivotal point 22, there is provided a flexible blade 24 preferably composed of metal which is placed in a slit 23 in the present instance and secured by screws 25. The blade 24 is mounted to press against the surface 2 and is ground in such a way that it lies in intimate engagement with the surface 2 throughout its whole width.

Transversely through the main body 21, there extends the supply chamber 26 which forms a channel to receive the coagulation liquid supplied thereto by any suitable means such as a pump or the like.

This chamber 26 may be used to supply any other liquid between the strip 5 and the surface 2. The quantity of the liquid so supplied will of course be controlled by the pump (not shown).

A large number of minute orifices such as 27, 28 and 29 are provided to form communications between the chamber 26 and the inner or lower surface of the strip 5, the surface 2 and even the blade 24.

The device 10 preferably also is tapered at its end adjacent to its shaft 22 as shown and provided with a slit 30 and screws 31 to receive and secure the blade 32 preferably composed of rubber which intimately engages the surface 2.

The blade 24 which constitutes the advance edge relative to the movement of the pouring base 3 effects the transfer of the strip 5 from the surface 2 to the back of the device 10. The supply of liquid through the orifices 27 and 29 facilitates the transfer of the strip 5 onto the back of the device 10. The blade 32 guides the strip 5 back to the surface 2, so that throughout this path of movement the strip 5 is constantly supported, so that it may not acquire any striations, streaks or irregularities.

The strip 5 while so advanced on the back of the device 10, the surface 2 is supplied with liquid through the orifices 28 and thereby moistened.

The mode of operation of this process comprises completing not only the coagulation upon the surface 2 but also the subsequent reactions, for the period required completely to solidify the strip 5. During the main coagulation reaction, the pouring base 3 is dry but thereafter and that is just before arriving at the device 10 and the covered part beyond it, the pouring base 3 is moistened with coagulation fluid or with a similar suitable liquid. This process is particularly characterized by providing the device 10 which supplies a fresh reaction liquid between the strip 5 and the surface 2 and insures that the strip 5 at this time is not transported without an effective support and furthermore in that between the removing roller 12 and the pouring base 3, the surface 2 is freed of moisture and arrives in a dry condition at, and under the nozzle 4.

In the embodiment shown in Fig. 1, the device 10 is located above the level of the coagulation fluid 6, the guiding roller 11 of Fig. 2 dispensed with and the strip 5 preferably removed by the conveyor 33 extending around the rollers 34 and 35, the roller 35 being disposed above the trough 36 into which the strip 5 is then advanced, from which the strip 5 is fed by any suitable means to one or more or other treatment baths and the like according to the process being practiced.

In the embodiment shown in Fig. 2, on the other hand, after the strip 5 is removed by the roller 12, it passes under the idler 37 and then over the roller 38 whereupon it is advanced down into the trough 36.

Preferably especially when the device 10 is positioned below the level of the liquid 6 in order to insure maintaining the stripping blade 24 in intimate engagement with the surface 2 of the base 3, the shaft 22 has fixed thereon a lever 40 to receive the weight 41 as shown to exercise a torque on the shaft 22 and in turn to press in the blade 24 into intimate engagement with the surface 2 of the base 3 as shown.

It is recognized that films derived from viscose as a base have heretofore been successfully produced. These films, however, always exceeded in weight 0.40 ounce per 1000 square inches. The thinnest films derived from viscose heretofore produced have a thickness corresponding to 0.80 ounce per 1000 square inches.

It is also recognized that films derived from cuprammonium as a base have heretofore been

produced which had a thickness corresponding to 0.40 ounce or less per 1000 square inches.

By means of the present invention, however, films derived from viscose as a base have for the first time been produced in thickness corresponding to 0.40 ounce or less.

Films derived from viscose as a base are clearly distinguishable in kind from films derived from cuprammonium as a base, not only by means of physical but chemical tests.

It is obvious that various changes and modifications may be made to the details of construction without departing from the general spirit of the invention as set forth in the appended claims.

I claim:

1. The process of manufacturing strips and the like from viscose and the like cellulose solutions consisting in pouring a viscous layer directly onto a pouring base without any intervening unsupported free space, immersing the layer so supported into a coagulating bath for a period which is sufficient to permit the coagulating fluid to start penetrating the layer to said support, then freeing the layer from the base, and supplying a fresh coagulating fluid to the inner face of the layer so freed, and returning the layer so freed to the pouring base and retaining the layer thereon until effectively coagulated.

2. The process of manufacturing strips and the like from viscose and the like cellulose solutions consisting in pouring a viscous layer directly onto a supporting base without any unsupported intervening free space, actuating the base thereupon to immerse the layer into a coagulating bath, freeing the layer from said base when the coagulation fluid begins to penetrate the layer to said base, supporting the layer while so being freed, supplying a coagulating fluid to the inner face of the layer so freed, thereupon returning the layer to said base, and retaining the same so supported until coagulated throughout.

3. The process of manufacturing strips and the like from viscose and the like cellulose solutions consisting in pouring a viscous layer directly onto a supporting base without any unsupported intervening free space, actuating the base thereupon to immerse the layer into a coagulating bath, freeing the layer from said base when the coagulation fluid begins to penetrate the layer to said base, supporting the layer while so being freed, supplying a fresh supply of coagulating fluid to the support and to the unexposed face of said layer when initially freed to facilitate the coagulation action, returning the layer to said base, and retaining the same so supported until coagulated throughout.

4. In the process of manufacturing strips and the like, from viscose and the like cellulose solutions, in which a viscous layer is spread directly onto a supporting base without any unsupported intervening free space, the base is actuated to immerse the layer into a coagulating bath, and the so coagulated layer is removed and subjected to regenerating and other treatments, the steps which comprise freeing the layer from said base when the coagulation fluid begins to penetrate the layer to said base, supporting the layer while so being freed away from said base, supplying a coagulating fluid to the inner face of the layer so freed, and returning the layer to said base and retaining the same to supported thereon until coagulated throughout.

5. In the process of manufacturing strips and

the like, from viscose and the like cellulose solutions, in which a viscous layer is spread directly onto a supporting base without any unsupported intervening free space, the base is actuated to immerse the layer into a coagulating bath, the so coagulated layer is removed and subjected to regenerating and other treatments, and in addition the supporting base is freed from any coagulating liquid deposits and is then returned to further support the layer being poured, the steps which comprise freeing the layer from said base when the coagulation fluid begins to penetrate the layer to said base, supporting the layer while so being freed away from said base, supplying a coagulating fluid to the inner face of the layer so freed, and returning the layer to said base and retaining the same so supported thereon until coagulated throughout.

6. In the process of manufacturing strips and the like, from viscose and the like cellulose solutions, in which a viscous layer is spread directly onto a supporting base without any unsupported intervening free space, the base is actuated to immerse the layer into a coagulating bath, and the so coagulated layer is removed and subjected to regenerating and other treatments, the steps which comprise freeing the layer from said base when the coagulation fluid begins to penetrate the layer to said base, supporting the layer while so being freed away from said base, supplying a coagulating fluid to the support and to the inner face of the layer so freed, and returning the layer to said base and retaining the same so supported thereon until coagulated throughout.

7. In the process of manufacturing strips and the like, from viscose and the like cellulose solutions, in which a viscous layer is spread directly onto a supporting base without any unsupported intervening free space, the base is actuated to immerse the layer into a coagulating bath, the so coagulated layer is removed and subjected to regenerating and other treatments, and in addition the supporting base is freed from any coagulating liquid deposits, is then dried and returned to continue supporting the layer being spread, the steps which comprise freeing the layer from said base when the coagulation fluid begins to penetrate the layer to said base, supporting the layer while so being freed away from said base, supplying a coagulating fluid to the support and to the inner face of the layer so freed, and returning the layer to said base and retaining the same so supported thereon until coagulated throughout.

8. The process of manufacturing strips and the like from viscose and the like cellulose solutions consisting in spreading a viscous layer directly onto a supporting base without any intervening unsupported free space, coagulating the layer by immersing the same while supported on the base into a coagulating bath for a period which is sufficient to permit the coagulating fluid to start penetrating the layer to said support, detaching the layer from the base, transporting the detached layer at a distance removed from the base, thereupon returning the layer to the original supporting base, and retaining the same so supported thereon until coagulated throughout.

9. The process of manufacturing strips and the like from viscose and the like cellulose solutions consisting in spreading a viscous layer directly onto a supporting base without any intervening unsupported free space, coagulating the layer by immersing the same while supported

on the base into a coagulating bath for a period which is sufficient to permit the coagulating fluid to start penetrating the layer to said support, detaching the layer from the base, transporting the detached layer at a distance removed from the base, supplying further coagulating fluid to the inner face of the layer and to the supporting base, thereupon returning the layer to the original supporting base, retaining the same so supported thereon until coagulated throughout, and finally removing the thoroughly coagulated strip from the base.

10. A flexible transparent and strong cellulose strip, regenerated from viscose, free from striations, streaks and irregularities having a weight per 1000 square inches of less than 0.40 ounce,

5 said strip being produced by spreading a viscose cellulose solution directly onto a supporting base, immersing the layer so supported into a coagulating bath for a period which is sufficient to permit the coagulating fluid to start penetrating the layer to said support, then freeing the layer from the base, supporting the layer while so being freed away from said base, and supplying a fresh coagulating fluid to the inner face of the layer so freed, returning the layer so freed to the original supporting base, retaining the layer thereon until effectively coagulated, and finally removing the solidified strip from the supporting base, regenerating, bleaching, washing and drying the strip in subsequent treatments.

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