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PROCESS FOR MANUFACTURING FOILS

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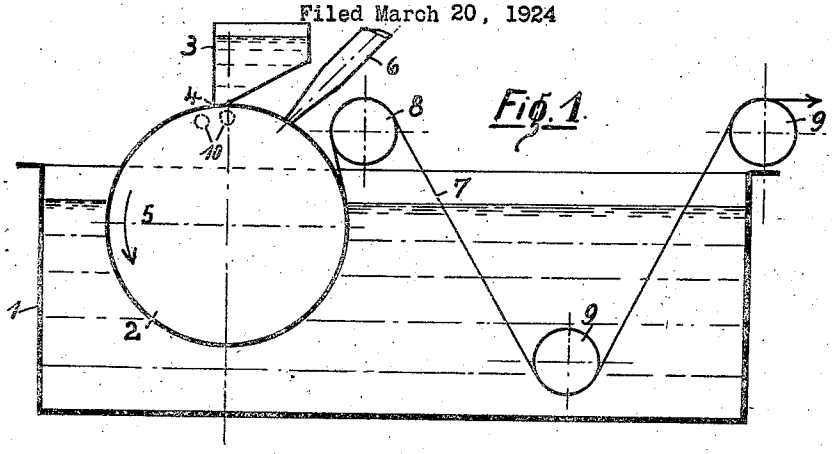



Fig. 1.

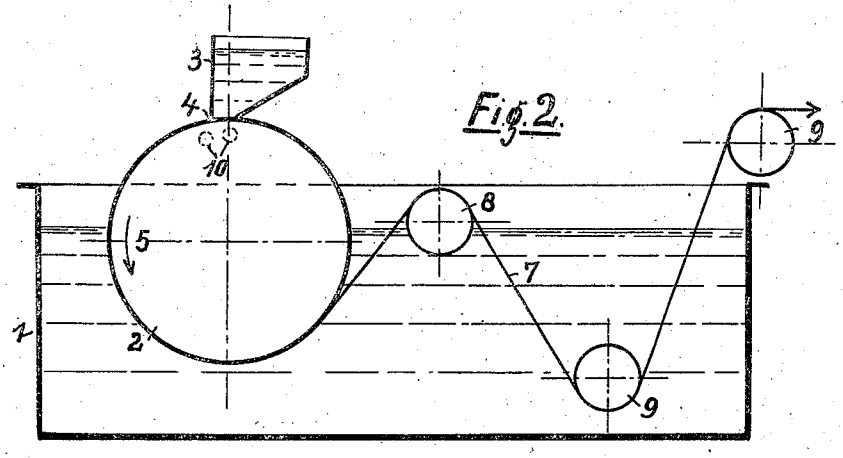



Fig. 2.

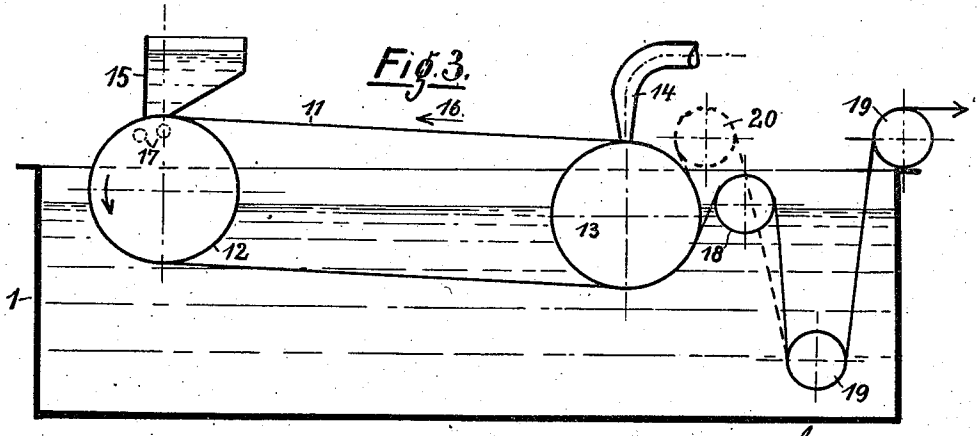



Fig. 3.

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# UNITED STATES PATENT OFFICE.

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## PROCESS FOR MANUFACTURING FOILS.

Application filed March 20, 1924, Serial No. 700,672, and in Germany June 16, 1922.

This invention relates to foils or films to be obtained from solutions of cellulose and cellulose compounds, and it refers in particular to novel means of effecting the coagulation of the solution upon the carrier. In its broad aspects it is applicable to the manufacture of foils or films from any kind of solutions of cellulose and of cellulose compounds, of gelatine and the like, and it is intended to provide means whereby in a comparatively short time and by simple manipulations, and in a short way a foil or film may be produced which has been solidified or coagulated to such an extent that it may be moved freely in the additional solidifying or coagulating solutions or baths. In view thereof and in accordance with my invention the solution of cellulose or of cellulose compounds, of gelatine or the like is applied to the carrier, a roller or a rotatingly fed ribbon, apron, web or the like for instance, after the carrier has been wetted with the coagulating, solidifying or precipitating agent. The preliminary wetting of the carrier may be effected for instance by a separate nozzle by means of which the precipitant is sprinkled on the carrier. By proceeding in this manner the result is accomplished that the solidification or precipitation commences at the moment when the liquid, gelatine or viscose, for instance, after being discharged from the ejecting or pouring vessel is made to flow upon the moistened movable carrier. The solidification or coagulation is continued during the further movement of the carrier through the coagulating or precipitating bath, the precipitation being effected from both sides of the liquid coating material. By properly proportioning the length and velocity of movement of the carrier the web-like pellicle of coagulable material, such as viscose, gelatine or the like possesses such a superior degree of strength and firmness as compared with the pellicles precipitated from one side only that the new pellicle, being precipitated from both sides, can be easily detached from the supporting carrier and may be conducted through the remaining precipitating and washing baths, while in a freely suspended position. In view of the fact that the precipitation takes place immediately upon the pouring of the solution onto the movable supporting carrier, any liability of adhesion of the viscose, gelatine or the like to the carrier, as has been the case in previous processes, is avoided, inasmuch as the precipitation begins from the bottom side, so that there is no further necessity of scraping and cleaning the supporting ribbon or apron at the point of detachment, nor is there any necessity of cleaning of the carrier beyond said point.

The detaching of the coagulated ribbon may preferably be effected below the level of the precipitating bath. In this case the wetting of the supporting carrier by a separate nozzle may be dispensed with, provided there is a corresponding freely exposed length of carrier between the point of detachment and the level of the precipitating bath. The accomplishing of the desired result may be facilitated by preferably heating the supporting carrier within the effective reach of the pouring vessel, by which means the coagulation or precipitation of the viscose and of equivalent substances is accelerated and the process considerably shortened. This is a point of great importance in view of the low velocities of the supporting carrier occurring in this connection.

The invention will be more fully described with reference to the accompanying drawing, showing in a diagrammatic manner and by way of example the means of carrying out the invention in several forms of embodiment in Figures 1 to 3. According to Figure 1 a rotatable drum is used as supporting carrier for the solution of cellulose, and Figure 2 shows a modification of the arrangement represented in Figure 1, the coagulated band being detached from the drum below the level of the bath according to Figure 2. Figure 3 illustrates another form of embodiment of the invention employing a band-like supporting carrier.

In the tank 1, as shown in Figure 1 of the drawing, and which contains the precipitating or coagulating liquid a drum 2 is disposed near one end thereof, which is rotated in the direction of the arrow 5 in any suitable manner. Upon said drum 2 the film producing liquid, such as a solution of viscose for instance, is caused to flow from the receptacle 3 and is applied by means of the ejector or pourer 4. The nozzle 6 which is preferably inclined opposite to the direction of rotation of the drum 2 is adapted to apply precipitants upon the drum and is mounted between the level of the precipitating bath and the ejector or pourer 4, so that

the drum has already been wetted with precipitating or coagulating material, when it arrives below the ejector 4. The detaching of the coagulated or solidified band or ribbon 7 is effected above the bath of precipitating liquor by means of a roller 8, and the said ribbon 7 is then conducted through the precipitating bath over the rollers 9 in a freely suspended condition. In the interior of the drum 2 and within the effective reach of the pourer or ejector 4 heating pipes 10 may be arranged which are adapted to heat the supporting carrier, which in the present instance is represented by the drum 2. As a precipitating bath any of the usual precipitating or coagulating liquors, such as chloride of ammonia, may be used.

In the embodiment represented in Figure 2 of the drawing the detaching of the coagulated ribbon or band 7 from the drum 2 is effected below the level of the precipitating bath, in which case the additional admission of the precipitating liquor by a nozzle is dispensed with. The drum 2 becomes wetted with a sufficient coat of precipitating liquor within the precipitating bath itself, provided the portion of the periphery of the drum between the point of detaching the ribbon and the level of the precipitating liquor is correspondingly adjusted; so that also in this case the band of viscose or the like discharged from the ejector 4 is immediately coagulated from below. Otherwise the arrangement of the different pieces of apparatus according to Figure 2 agrees with that shown in Figure 1 of the drawing.

Figure 3 illustrates a form of embodiment of the principles of the invention, using an apron or a band-like supporting carrier. The apron 11 of suitable material is conducted in this case in an inclined position over the two drums 12 and 13. At the position of the drum 13 disposed at a lower level precipitating agent is squirted upon the carrier apron from the nozzle 14, while the pouring out of the viscose or the like from the ejector 15 is effected at the position of the drum 12 at a higher level. The carrier apron 11 is moving in the direction of the arrow 16, and is already wetted with the precipitant when it arrives below the ejector or pourer 15, so that in this case likewise an immediate coagulation is accomplished. The coagulated ribbon is detached below the level of the precipitating bath from the carrier apron 11 by means of a roller 18, and is then conducted in a freely suspended position through the precipitating bath over the rollers 19. Instead of this arrangement I may also proceed to effect the detaching of the ribbon above the level of the precipitating bath by means of a roller 20, as shown in dotted lines in Figure 3. The drum 12 may be provided with heating pipes 17 within the operative reach of the ejector 15 with the effect of assisting the coagulation according to the process. The drums 12, 13 are operated in the usual manner. The invention has been shown and described in its broad aspects only, and it should be understood that it is not restricted to the particular means herein shown, but it is susceptible of other modifications and changes to better adapt it to existing conditions and to the convenience of the user, and within the scope of the claims hereunto appended.

We claim:—

1. The method of manufacturing foils from cellulosic solutions, such as viscose, capable of being precipitated, which comprises wetting a carrier with such a liquid as will quickly precipitate the cellulosic solution, heating from below the said carrier, flowing said cellulosic solution on the wetted carrier to form a foil, and treating the exposed surface of the foil with precipitating liquid, the velocity of the carrier and the extent of treatment with the precipitating liquid being regulated to thoroughly precipitate the foil.

2. Process for the continuous manufacture of foils from cellulosic solutions, such as viscose, capable of being precipitated, which comprises causing an endless carrier to progress with a portion of its travel through such a liquid as will quickly precipitate the cellulosic solution, whereby the carrier is wetted, flowing said cellulosic solution on the wetted carrier to form a foil, and passing the foil supported by the carrier down through the precipitating liquid, the velocity of the carrier and the extent of treatment with the precipitating liquid being regulated to thoroughly precipitate the foil.

In testimony whereof we have signed our names to this specification.

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