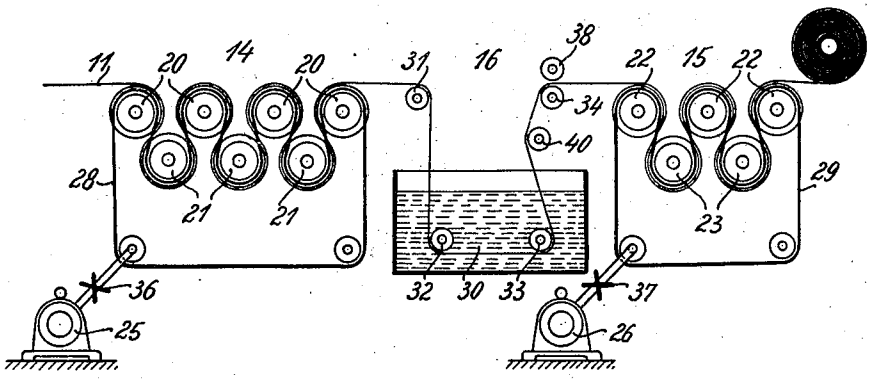
Oct. 2, 1934. E. BLEIBLER 1,975,708

METHOD AND APPARATUS FOR DRYING FOILS, FILMS, STRIPS, SHEETS, RIBBONS, WEBS, PREFERABLY OF CELLULOSE

Filed Oct. 23, 1930

Fig. 1



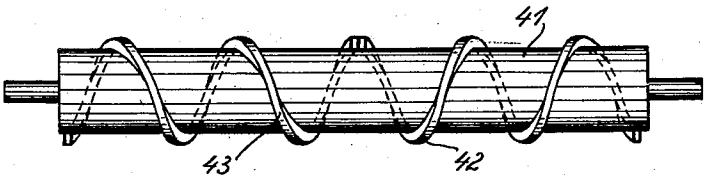


Fig. 2



Fig. 3

Inventor:
Ernst Bleibler,
By Byrnes, Townsend & Potter,
Attorneys.

Patented Oct. 2, 1934 1,975,708

UNITED STATES PATENT OFFICE

1,975,708

METHOD AND APPARATUS FOR DRYING FOILS, FILMS, STRIPS, SHEETS, RIBBONS, WEBS, PREFERABLY OF CELLULOSE

Ernst Bleibler, Winterthur, Switzerland, assignor to Sylvania Industrial Corporation, Fredericksburg, Va., a corporation of Virginia

Application October 23, 1930, Serial No. 490,769
In Germany October 29, 1929

4 Claims. (Cl. 34—48)

My invention relates to a method of and apparatus for drying ribbons, films, sheets, strips, membranes, webs or thin foils, more particularly those derived from aqueous solutions of cellulose, and specifically to such foils, strips and the like as are precipitated by a continuous process from viscose or similar cellulose products, and which are passed over drying rollers or cylinders during the drying process.

The object of my invention is to improve the quality of these products by finishing them in such a way that they possess perfectly smooth surfaces free from any flaws. A further object of my invention is to reduce the losses resulting from shrinkage during the drying process to a minimum.

My invention consists in remoistening the webs or strips towards the end of the drying process and at the same time relaxing their tension. In a preferred process according to my invention this relaxation of the tension and remoistening of the webs takes place as soon as ¾ of the original moisture has been withdrawn from the product.

A further object of my invention is to provide means for relaxing and restoring the tension of the strips.

In the accompanying drawing a number of embodiments of my invention are illustrated by way of example. It will be understood, however, that my invention is by no means limited to these constructions and that the scope of my invention and the ambit of my appended claims extend to any construction incorporating the broad principle underlying my invention.

In the drawing

Fig. 1 shows a diagrammatic cross-section through a drying plant according to my invention, and

Figs. 2 and 3 show spreaders to be employed in the plant shown in Fig. 1, in elevation.

Referring to Fig. 1 of the drawing the foil, strip or web 11 to be dried is fed to the drying apparatus either from a storage reel or immediately from the process of manufacture. The drying apparatus consists of two or more dryer sections 14 and 15 between which is interposed a relaxing or detensioning and moistening apparatus 16. The drying apparatus consists of rollers 20, 21 and 22, 23 which support the web to be dried alternately on its opposite sides and which are driven in a suitable manner, for instance by means of belts 28 and 29 and motors 25 and 26. For controlling the speeds of both groups of rollers independently suitable regulating means 36, 37, such as step pulleys or the like, may be interposed between the motors and the belts. The motors themselves may be regulated in suitable manner, or the motion of the groups of rollers may be derived from a common drive through suitable regulating gears, line shafting or the like.

After the web has traversed the first dryer section and preferably has given off about ¾ of its moisture, the tension on it is relaxed and it passes over the guide rollers 31—34 through a bath 30 for remoistening.

By the relaxation of the tension and the remoistening an automatic equalization of the strains in the material first takes place while the absorption of liquid remains comparatively low in spite of the moistening. It has been ascertained that in such products, and particularly in cellulose sheets or foils of glass like appearance used for wrapping confectionery and the like, the absorption capacity for liquids is quickly reduced as soon as about half the moisture originally contained in the product has been removed. While, for instance, the proportion of water in a cellulose product at the beginning of the drying process amounts to about 800% calculated on the weight of the cellulose, the product after its moisture has been reduced down to 20–30% of its initial moisture weight is no longer able to absorb more than about 200% of moisture calculated on the weight of the cellulose. A slight swelling of the material occurs upon the absorption of this quantity of moisture, but this swelling is only superficial and has the effect that all unevennesses and irregularities in the surface of the material disappear. It is possible in this condition of the foil to compensate the shrinkage losses which developed across the width of the material during the drying process.

In the customary drying processes it is extremely difficult to avoid shrinkage of the foil which is caused by the fact that the conveying speed of the foil does not coincide accurately with the shrinkage conditions; these undesirable shrinkages occur particularly at the unsupported places of the foil and make themselves disagreeably noticeable by the product losing considerably in width.

These drawbacks are effectively eliminated by the process according to my invention. After the tension has been released and the material has been moistened again the strains which have remained in the material in consequence of the shrinkage are first neutralized. This causes the product to recover a portion of its lost width

during the further progress of the drying process. This recovery of the lost width may be augmented by interposing between the moistening apparatus and the following dryer section spreaders 40, as well known in the textile industry. As Fig. 2 of the drawing shows, rollers 41 on the circumference of which oppositely directed helices 42, 43 are provided may be used for the purpose. Conical rollers 45, 46 slightly inclined in relation to each other and facing each other with their points, as shown in Fig. 3 may equally well be employed as spreaders. These spreaders apply to the material forces directed transversely to the direction of travel and thus exert a transverse stretching action upon the foil.

The spreader may be followed by a squeezing apparatus 34 which strips off the liquid carried along by the surface of the foil or film. To enable the relaxation of the film to be controlled during the moistening process, the individual drying sections of the plant separated by the moistening apparatus are provided with separately regulatable drives. By regulating the driving speed it is then easily possible to keep the material during the remoistening period at the tension just desired and differing from the tension of the dryer sections.

As remoistening bath any suitable material may be used, for instance a cleaning or any other agent by means of which certain properties may be imparted to the final product. A glycerine or an oil bath may, for instance, be interposed to render the material flexible or to impregnate it in order to render it impervious to moisture. Baths consisting of a solution of alum may also be used for the purpose of hardening the material, or solutions of coloring matters for dyeing the material, or baths which impart to the material a certain lustre. Furthermore, baths, such as glycerine, grape sugar and glucose, may be employed which displace the water contained in the product and thus assist the further drying process without rendering the product itself hard or brittle.

The drying process is preferably carried out at moderate temperatures, for instance at a surface temperature between 50 and 70° C., so that the material is not adversely affected and becomes readily susceptible to the intermediate treatment.

It will be understood that the invention is not limited to the embodiments described and illustrated by way of example and that various structural changes and modifications may be made without departing from the spirit of my invention, and I desire therefore that the appended claims should be construed in the light of prior knowledge.

I claim as my invention:

1. A continuous process of drying regenerated cellulose in web form which comprises an initial step of drying consisting in passing the web over drying rolls while the web is maintained under tension, an intermediate step consisting in rewetting the web while the latter is maintained under diminished tension, and a final drying step consisting in passing the re-wetted web over drying rolls while restoring the tension on the web.

2. The process as set forth in claim 1 wherein the drying process is interrupted as soon as at least ¾ of the moisture has been extracted from the web,

3. Apparatus for drying regenerated cellulose in web form and rewetting said cellulose film intermediate said drying process according to the method set forth in claim 1, said apparatus comprising in combination a first set of drying rolls, a second set of drying rolls, at least one bath receptacle for rewetting the web interposed between said two sets of drying rolls, means for passing the web over said first set of drying rolls, said means being adapted to tension the web while passing over said set, means for passing the web through said bath receptacle and adapted to relax the tension of said web during passage of the latter through said receptacle, and means for passing the web over said second set of drying rolls and adapted to restore the tension on the web after the rewetting.

4. Apparatus for drying regenerated cellulose in web form and rewetting said cellulose film intermediate said drying process, according to the method set forth in claim 1, said apparatus comprising in combination a first set of drying rolls, a second set of drying rolls, at least one bath receptacle for rewetting the web interposed between said two sets of drying rolls, means for passing the web over said first set of drying rolls, said means being adapted to tension the web while passing over said set, means for passing the web through said bath receptacle and adapted to relax the tension of said web during passage of the latter through said receptacle, means for passing the web over said second set of drying rolls and adapted to restore the tension on the web after the rewetting and means adapted to regulate the speed of the two sets of drying rolls separately and independently of each other.

ERNST BLEIBLER.