

## PATENT SPECIFICATION

Application Date : Dec. 23, 1926. No. 32,582 / 26.

287,635

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Complete Accepted : March 23, 1928.



## PROVISIONAL SPECIFICATION.

**Improvements in or relating to the Manufacture of Sheets or Films  
of Compositions Containing Cellulose Esters or Ethers.**

We, SPICERS LIMITED, a British company, of 19, New Bridge Street, London, E.C. 4, and HENRY JAMES HANDS, a British subject, of 100, Duke's Avenue, Chiswick, W. 4, do hereby declare the nature of this invention to be as follows:—

This invention relates to the manufacture of sheets or films of compositions containing esters or ethers of cellulose, such as cellulose acetate, by spreading a solution of such composition in a volatile solvent on a surface, drying off the solvent and removing the sheet or film from the surface.

In such manufacture it is found that traces of solvent remain in the product after removal thereof from the surface on which it is formed. This residual solvent is apt to cause cockling or distortion of the product, and, moreover, it imparts an undesirable odour thereto.

According to the present invention these disadvantages are minimised by passing the product, after it leaves the aforesaid surface, through a space maintained charged with water-vapour, at a temperature preferably considerably above room-temperature. It is found that such treatment abstracts the residual solvent uniformly and thereby prevents the cockling or distortion which would be caused by the uneven and partial drying-out which would ensue if the product were merely wound on to a storage-roll or cut up into lengths and stacked while still containing traces of solvent. Moreover the mist or fog which is formed in the aforesaid space effectually removes any electric charge from the surface of the product, thus eliminating the risk of sparking and consequent ignition of the vapour of the solvent or other combustible matter in the vicinity.

Preferably, the product is maintained in an extended or stretched condition while under treatment with moist air or with steam.

The invention may be performed in the

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following manner, assuming that the product is manufactured by applying continuously a solution of its ingredients to an endless travelling band from which the product, substantially dry, is continuously removed. An extended hood or tunnel is provided within which is a series of rollers of small diameter placed cross-wise of the hood or tunnel along its whole length and parallel to one another. The product when stripped from the endless band is passed into the hood and in zig-zag fashion between the rollers—that is to say, over one roller, under the next, and so on. Steam in small quantities is led into the hood or tunnel, thus saturating the air within it, raising its temperature and at the same time condensing in part to form a visible mist. The amount of steam supplied should be insufficient, however, to wet the product or the rollers; only as much should be supplied as will maintain the air in a warm damp "steamy" condition and the current of steamy air may be accelerated by a fan.

The steam is preferably supplied at two points—namely at the entrance to the hood or tunnel and therefore near the point at which the product is stripped from the endless band, and at a point about half-way along the hood or tunnel. On emerging from the latter (which may be about forty feet long, more or less) the product is found to be odourless or nearly so and if cut into lengths and stacked no cockling or distortion can be detected.

In one arrangement the steam at each point of introduction is led to a pipe lying across the tunnel and disposed below the film (e.g. a foot or two below).

Dated this 23rd day of December, 1926.

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Chartered Patent Agents.

## COMPLETE SPECIFICATION.

**Improvements in or relating to the Manufacture of Sheets or Films  
of Compositions Containing Cellulose Esters or Ethers.**

We, SPICERS LIMITED, a British company, of 19, New Bridge Street, London, E.C. 4, and HENRY JAMES HANDS, a British subject, of 100, Duke's Avenue, Chiswick, W. 4, do hereby declare the nature of this invention and in what manner the same is to be performed, to be particularly described and ascertained in and by the following statement:—

This invention relates to the manufacture of sheets or films (more particularly very thin films) of compositions containing esters or ethers of cellulose, such as cellulose acetate, by spreading a solution of such composition in a volatile solvent on a surface, drying off the solvent and removing the sheet or film from the surface.

In such manufacture it is found that traces of solvent remain in the product after removal thereof from the surface on which it is formed. This residual solvent is apt to cause cockling or distortion of the product, and, moreover, it imparts an undesirable odour thereto.

It is also found that the product carries an electric charge which is a source of danger and inconvenience.

According to the present invention the product, after it leaves the aforesaid surface, is passed through a space maintained charged with water-vapour, at a temperature preferably considerably above room-temperature. It is found that such treatment abstracts the residual solvent uniformly and thereby prevents the cockling or distortion which would be caused by the uneven and partial drying-out which would ensue if the product were merely wound on to a storage-roll or cut up into lengths and stacked while still containing traces of solvent. Moreover the mist or fog which is formed in the aforesaid space effectually removes any electric charge from the surface of the product, thus eliminating the risk of sparking and consequent ignition of the vapour of the solvent or other combustible matter in the vicinity.

Preferably, the product is maintained in an extended or taut condition while under treatment with moist air or with steam.

The invention further comprises apparatus for carrying out the method above mentioned as applied to a continuous process of manufacturing sheets

or films, such apparatus comprising an extended hood within which are guide-rollers for the sheet or film, means for applying tension continuously to the sheet or film and steam-supplying means beneath the hood.

A practical embodiment of the invention will now be described by way of example with reference to the accompanying drawings, in which

Figure 1 is a diagrammatic side elevation in section of the apparatus.

Figure 2 is a section on the line 2—2 of Figure 1 on an enlarged scale, and

Figure 3 is a detail view of a modified construction.

In this embodiment the product is manufactured by applying continuously a solution of its ingredients to an endless travelling band from which the product, substantially dry, is continuously removed.

One of the drums which supports the endless band is shown at 10, Figure 1 and the product in the form of a film 11 is shown being stripped from the band and led away over rollers 12. A sheet-metal hood 13, shown in section in Figure 2, extends from the drum 10 and preferably consists of two portions inclined to one another as shown but may be horizontal from end to end.

Within the hood is a series of rollers 14 of small diameter (for example about two inches) placed cross-wise of the hood and parallel to one another. The rollers are spaced apart equally throughout the length of the hood and there may be for example twenty-eight such rollers in a hood about forty feet long.

The film 11 is passed into the hood and in zig-zag fashion between the rollers—that is to say, under one roller, over the next and so on. Tension is applied to the film as it emerges from the other end of the hood by any suitable means, as for example by the feed-mechanism of a device for cutting it into sheets and stacking them. In Figure 1, the tensioning means is represented diagrammatically by a storage roll 15. If desired, a pair of rubber-covered driven tensioning-rollers 16 may be provided about mid-way of the hood.

Low-pressure steam in small quantities is supplied to the hood through pipes 17 placed a foot or two beneath the hood

and provided with small holes 18 along their undersides. There may be two such pipes one placed at the entrance to the hood and the other about half-way along its length, as shown, and each is provided with a trough 19 beneath it to collect condensed steam.

The steam from the pipes 17 rises, impinges upon the lower side of the film and enters the hood, thus moistening and warming the air through which the film is passing and at the same time condensing in part to form a visible mist. The amount of steam supplied is regulated to product this effect without wetting the product or the rollers, only as much being supplied as will maintain the air in and beneath the hood in a warm damp "steamy" condition.

It is found that the film emerging from the hood is odourless or substantially so and if cut into lengths and stacked no cockling or distortion can be detected. Moreover the electric charge which would otherwise remain on the film leaks away to earth through the moisture-charged air.

Figure 3 illustrates an upward extension 20 of the hood which may be employed to obtain a longer path for the film through the moist air. It is provided with a roller 21 near its upper end over which the film is led as shown, and it is placed immediately above the steam-supply pipe 17 at the entrance to the hood. Another such extension may be provided above the second pipe 17.

The invention may be carried into effect in other ways, for example the hood may be replaced by a tunnel and moistened air may be supplied to the tunnel by means of a fan or fans, or by a chamber having rollers at the top and bottom over and under which the film is passed in a

series of loops, thereby obtaining a considerable length of path in a restricted space.

Having now particularly described and ascertained the nature of our said invention and in what manner the same is to be performed, we declare that what we claim is:—

1. The method of treating sheets or films of compositions containing esters or ethers of cellulose consisting in passing the sheet or film after it leaves the surface on which it is formed through a space maintained charged with water-vapour at a temperature preferably considerably above room-temperature, for either of the purposes described.

2. The method according to Claim 1 wherein the sheet or film is maintained in an extended or taut condition while passing through the space charged with water-vapour.

3. Apparatus for carrying out the method according to Claim 2 as applied to a continuous process of manufacturing sheets or films, comprising in combination an extended hood (such for example as 13) guide rollers within the hood for the sheet or film, means for applying tension continuously to the sheet or film, and steam-supplying means beneath the hood, for example pipes such as 17.

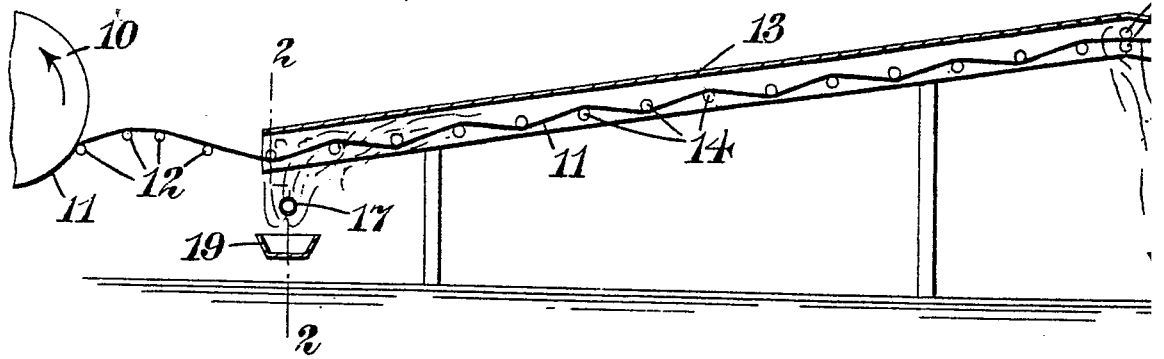
4. The apparatus for treating films or sheets of compositions containing esters or ethers of cellulose substantially as described with reference to Figures 1 and 2 or to Figure 3 of the accompanying drawings.

Dated this 31st day of August, 1927.

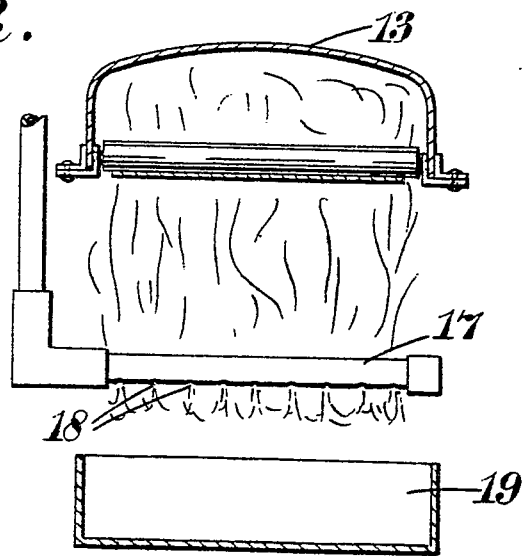
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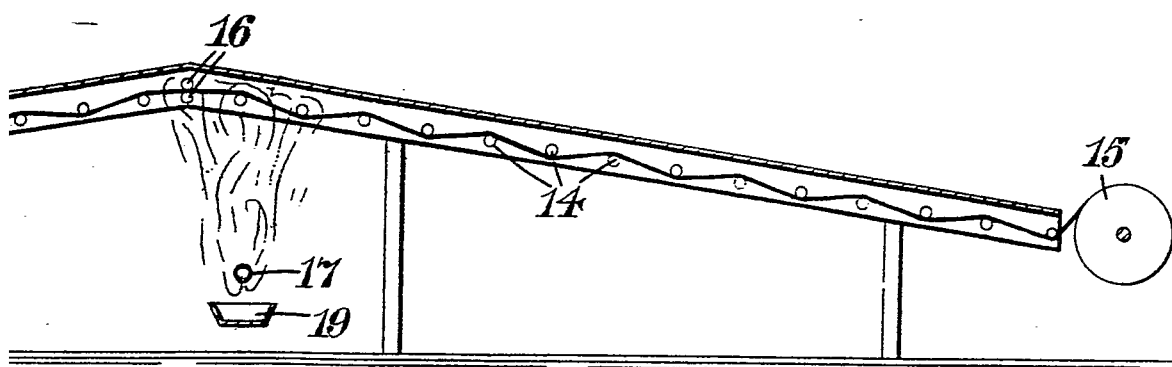
*Fig. 1.*



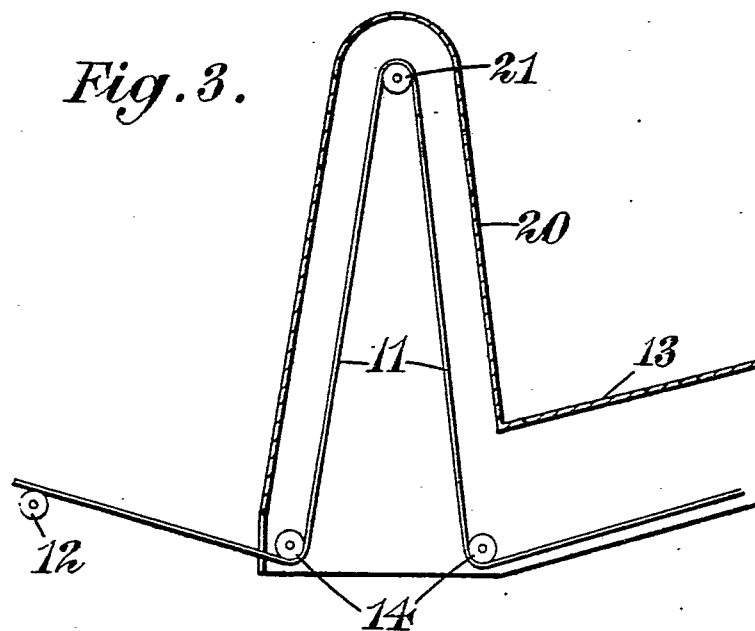
*Fig. 2.*



*[This Drawing is a reproduction of the Original on a reduced scale.]*



*Fig. 3.*



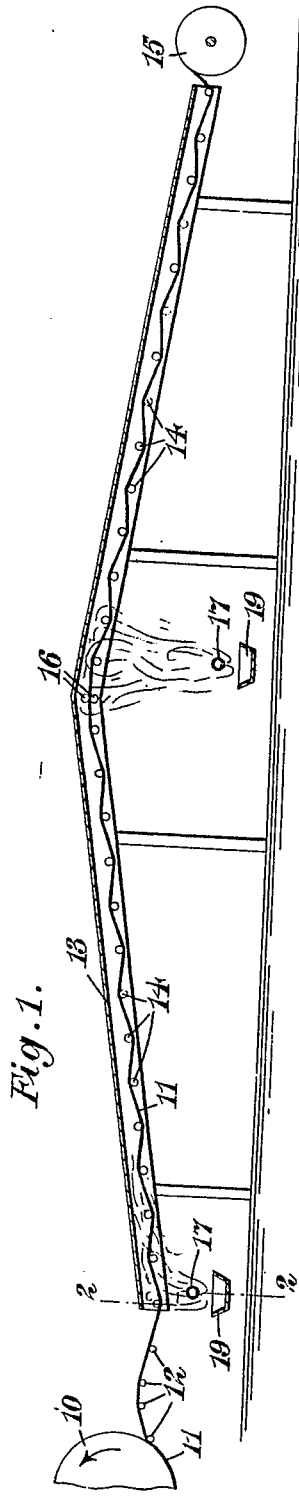


Fig. 2.

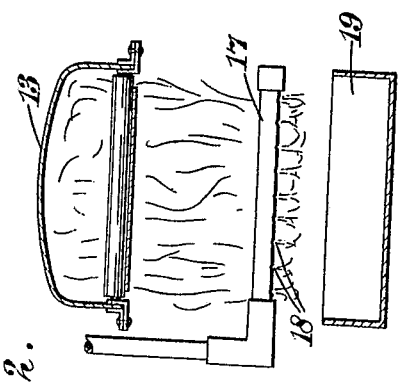
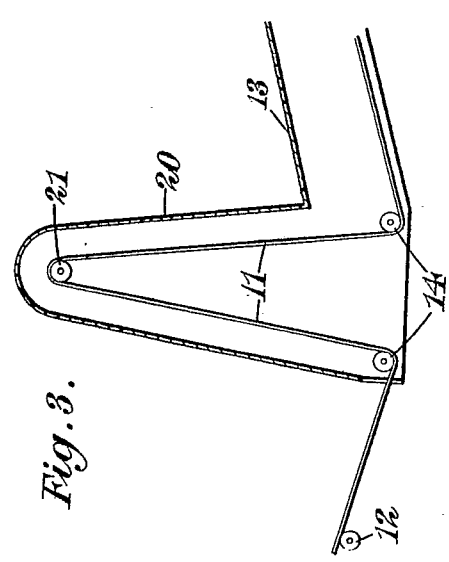


Fig. 3.



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