Nov. 12, 1940. H. T. CLARKE 2,221,019

COATING OF FILM BASES

Filed April 22, 1938

Fig. 1.

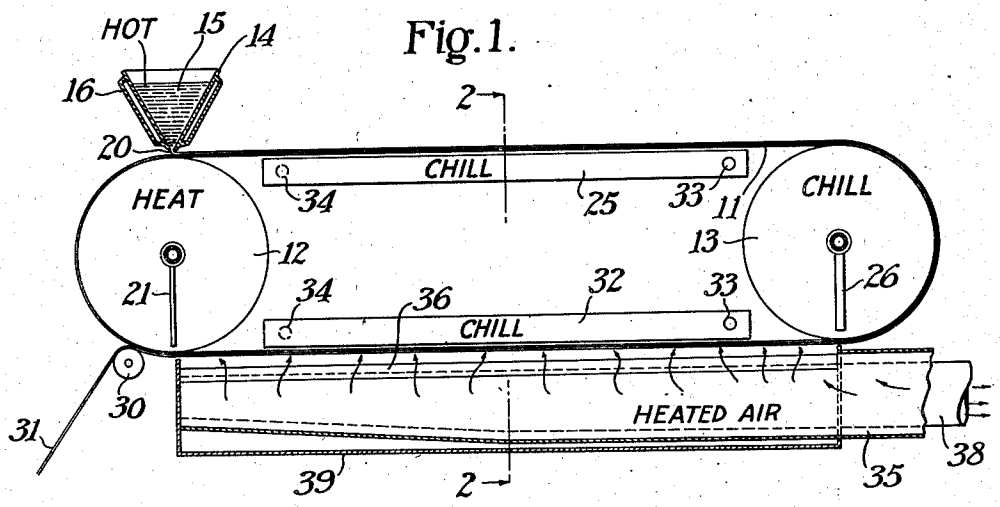
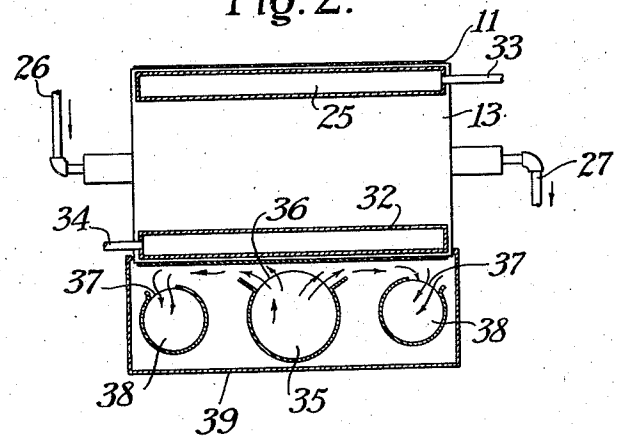


Fig. 2.



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COATING OF FILM BASES

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7 Claims. (Cl. 18—15)

The present invention relates to an apparatus for making continuous sheets or strips of materials by applying a coagulable "dope" to a coating surface, setting or coagulating the dope into a sheet, and then stripping the sheet from the coating surface. In particular, the invention relates to a formation of a film base from a hot dope which sets to an elastic jelly when cooled.

One object of the invention is the provision of an arrangement for avoiding slugs of coagulated or evaporated dope on the lip of the dope hopper.

Another object of the invention is the provision of such an arrangement which is simple, and highly effective.

To these and other ends, the invention resides in certain improvements and combinations of parts, all as will be hereinafter more fully described, the novel features being pointed out in the claim at the end of the specification.

In the drawing:

Fig. 1 is a simplified longitudinal sectional view of the apparatus constructed in accordance with the present invention; and

Fig. 2 is a transverse sectional view taken substantially on the line 2—2 of Fig. 1, showing the arrangement for chilling the sheet forming band, and curing the sheet while the latter is being moved by the band.

Similar reference numerals throughout the various views indicate the same parts.

In coating certain types of dopes for photographic film base and other purposes, it has been found that certain combinations of cellulose esters or other similar materials with special solvents offer great advantages both for coating speed and for physical properties of the finished film support. These combinations or dopes are those in which the solvent material is soluble only in the hot solvent, and forms a gel when the solvent is cooled. Thus, the coating of the sheet is made by applying a hot dope to a coating surface or wheel under which conditions the dope sets to an elastic jelly which can be stripped from the coating wheel with very great rapidity.

However, one difficulty with this type of coating is, that when the dope flows from a hot hopper onto a cold casting wheel or surface, a slug of coagulated or evaporated dope often tends to hang on the lip of the dope hopper, causing irregular coating. In order to overcome this difficulty, the present invention provides an arrangement for coating the dope on a band which passes around two spaced drums. The dope hopper is positioned directly above and adjacent one of these drums which is kept hot so that the band underneath the hopper is warm, thus avoiding the highly undesirable slugs on the lip of the hopper, the advantages of which will be readily apparent to those in the art. After the band has passed from under the hopper, it is cooled, as later described, to set the dope to a gel. Suitable means, to be later described, is also provided for removing the solvent from the set or jelled sheet so that the latter may be readily stripped from the band in the form of a continuous web.

In the drawing, the dope receiving surface comprises an endless belt or band 11 carried on spaced drums 12 and 13 of any well-known or suitable construction. The dope hopper 14 is supplied with hot dope 15 from a suitable source, not shown. In order to maintain the dope 15 in the hopper 14 in a hot condition, the hopper is surrounded with a water jacket 16 which is connected to a suitable source, not shown, of heating fluid such as hot water.

In order to prevent coagulation or evaporation of the dope, and the resulting formation of slugs, on the lip 20 of the hopper 14, the band 11 is preferably warmed prior to the passage thereof under the hopper. To secure this result, the drum 12 is heated by a suitable heating medium such as hot water which may be supplied to the drum 12 through a supply pipe 21. The cool water may be discharged from the drum 12 through a discharge pipe, not shown, to a suitable point of disposal. Thus the band 11 is sufficiently warmed prior to the disposition of the hot dope 15 on the band.

After the dope has been deposited on the band, the dope is chilled so as to set or gel the dope. This chilling means comprises, in the present embodiment, a chilling chest 25 positioned beneath the upper run of the band 11, as clearly shown in Fig. 1. This chilling chest sufficiently cools the adjacent portion of the band and sets the dope. In order to insure proper setting of the dope, the drum 13 may also be cooled by means of cold water which is supplied to the drum through a supply pipe 26, and is discharged therefrom through a pipe 27, as best shown in Fig. 2. The set sheet is drawn over the cool drum 13, and is carried along the lower run of the band 11, Fig. 1, to the stripping roll 30 to strip the sheet off the band 11 in the form of a continuous web 31.

To facilitate the ready stripping of the web from the band, the lower run of the band is preferably cooled by means of a chilling chest 32, similar to or identical with the chilling chest 25

for the upper run of the band. The chilling chests 32 and 25 are connected by pipes 33 and 34 to a suitable source of cooling medium such for example as cold water. This chilling of the band thus insures that the sheet will be sufficiently set before stripping, the advantages of which are apparent to those in the art.

Although the sheet has been sufficiently set, it still contains a large amount of solvent which should be removed prior to the stripping of the sheet from the band 11. In the preferred arrangement, these solvents are removed by currents of heated air which flow over the surface of the strip as the latter moves along the lower run of the band 11, as shown in Fig. 1. This heated air is supplied through pipe 35, the upper portion of which is provided with spaced orifices 36 of the shape best shown in Fig. 2, which direct the heated air against the exposed surface of the jelled strip on the lower run of the band 11. The air and solvent mixture is discharged through orifices 37 formed along the top of the pipes 38 which are positioned along opposite sides of the supply pipe 35, as clearly shown in Fig. 2. These discharge pipes are connected to a suitable source of vacuum, not shown, which draws the solvent laden air to some point of solvent recovery or to a point of disposal. The supply and discharge pipes 35 and 38 are encased in a housing 39 in which the curing air circulates, as shown in Figs. 1 and 2.

It is thus apparent from the above description that the present invention provides an arrangement for setting and curing a coagulable film dope to provide a continuous web or strip suitable for photographic film base. It is also apparent that the described arrangement also avoids the formation of the troublesome and highly objectionable slug formation on the hopper lip.

While one embodiment of the invention has been disclosed, it is contemplated that the inventive idea may be carried out in a number of ways. The present application is, therefore, not to be limited to the precise details described, but is intended to cover all variations and modifications thereof falling within the spirit of the invention and the scope of the appended claims.

I claim:

1. An apparatus for forming a strip of sheet material from a hot gel type dope, which congeals upon cooling, comprising in combination, a pair of spaced drums, a moving band arranged over said drums, a dope hopper positioned above one of said drums and adjacent said band and adapted to apply a thin layer of hot dope on said band, means for applying heat to the interior of said one drum for heating said band underneath said hopper to such a temperature as to prevent congealing of said dope at the point of application to said band, means for cooling said band only after it passes from underneath said hopper to congeal said dope into a sheet, and means for curing said congealed sheet while it is maintained in the congealed condition and as it is moved by said band.

2. An apparatus for forming a strip of sheet material from a hot dope comprising in combination, a pair of spaced drums, a moving band arranged over said drums, a dope hopper positioned above one of said drums and adapted to apply a thin layer of hot dope to said band, means for heating said one drum to warm said band underneath said hopper to such a temperature as to prevent slug formations on said hopper, means for chilling said band after it has passed underneath said hopper to congeal said dope into a sheet, and cooperating chilling and heating means for curing said sheet while it is maintained in the congealed condition and as it is moved by said band.

3. An apparatus for forming a strip of sheet material from a hot dope comprising in combination, a pair of spaced drums, a moving band arranged over said drums, a dope hopper positioned above one of said drums and adapted to apply a thin layer of hot dope to said band, means for heating one drum to warm said band underneath said hopper, means for chilling said band as it passes from underneath said hopper to congeal said dope into a sheet, means for applying warm air to the congealed sheet to cure the latter while on said band, and means independent of said curing means for maintaining said sheet in the congealed condition during said curing.

4. An apparatus for forming a strip of sheet material from a hot dope comprising in combination, a pair of spaced drums, a moving band arranged over said drums, a dope hopper positioned above one drum and adapted to apply a thin layer of dope to said band, means for heating said one drum to warm the portion of said band underneath said hopper to prevent slug formations on said hopper, means for chilling the band after it passes from underneath said hopper to congeal said dope into a sheet on said band, means for applying streams of curing air to said sheet after it has been congealed, means cooperating with said curing means to maintain said strip in congealed condition during such curing, and means adjacent said one drum for stripping the congealed cured sheet from said band in the form of a continuous web of uniform thickness.

5. A method of forming a strip of sheet material from a gel type dope which congeals upon cooling comprising, placing the dope in a hopper positioned above and adjacent to a continuously moving surface, heating the dope to an elevated temperature to keep the dope in fluid condition, casting the hot fluid dope from the hopper onto the continuously moving surface, heating the portion of said surface immediately below said hopper to maintain said portion at such a temperature as to prevent the congealing of said dope thereby preventing the formation of slugs on said hopper, cooling the portion of said surface immediately beyond said hopper and said first mentioned portion to congeal the hot fluid dope into a continuous sheet, and curing the congealed sheet.

6. A method of forming a strip of sheet material from a gel type dope which congeals upon cooling comprising, placing the dope in a hopper positioned above and adjacent to a continuously moving surface, heating the dope to an elevated temperature to keep the dope in fluid condition, casting the hot fluid dope from the hopper onto the continuously moving surface, heating the portion of said surface immediately below said hopper to maintain said portion at such a temperature as to prevent the congealing of said dope thereby preventing the formation of slugs on said hopper, cooling the portion of said surface immediately beyond said hopper and said first mentioned portion to congeal the hot fluid dope into a continuous sheet, curing the congealed sheet, and maintaining said sheet in congealed condition during said curing.

7. An apparatus for forming a strip of sheet material from a hot gel type dope which congeals upon cooling comprising, in combination, a pair of spaced drums, a moving endless band arranged

over said drums and extending in horizontal upper and lower runs therebetween, a dope hopper positioned above one of said drums and adjacent said band and adapted to continuously apply a thin layer of hot fluid dope onto said band, means for heating said hopper for maintaining the dope in a fluid condition therein, means for applying heat to said one drum to maintain the portion of said band immediately below said hopper at such a temperature as to prevent the congealing of the dope so as to thereby prevent the formation of dope slugs on the hopper, a cooling chamber positioned immediately below and adjacent the upper run of said band to cool said upper run to congeal said dope into a sheet thereon, a curing chamber extending below the lower run only of said band, means extending into said chamber for circulating a stream of curing air directly against the exposed surface of the congealed sheet to cure the latter as it is moved along said lower run, and a second cooling chamber positioned immediately above and adjacent the lower run of said band to cool said lower run to maintain the strip in a congealed condition thereon as the strip is being cured, said cooling chamber being spaced a sufficient distance from said one drum to prevent cooling of said portion of said band.

HANS T. CLARKE.