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PROCESS FOR REDUCING WEAK SPOTS IN CALENDERED FILM

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Fig. 1.

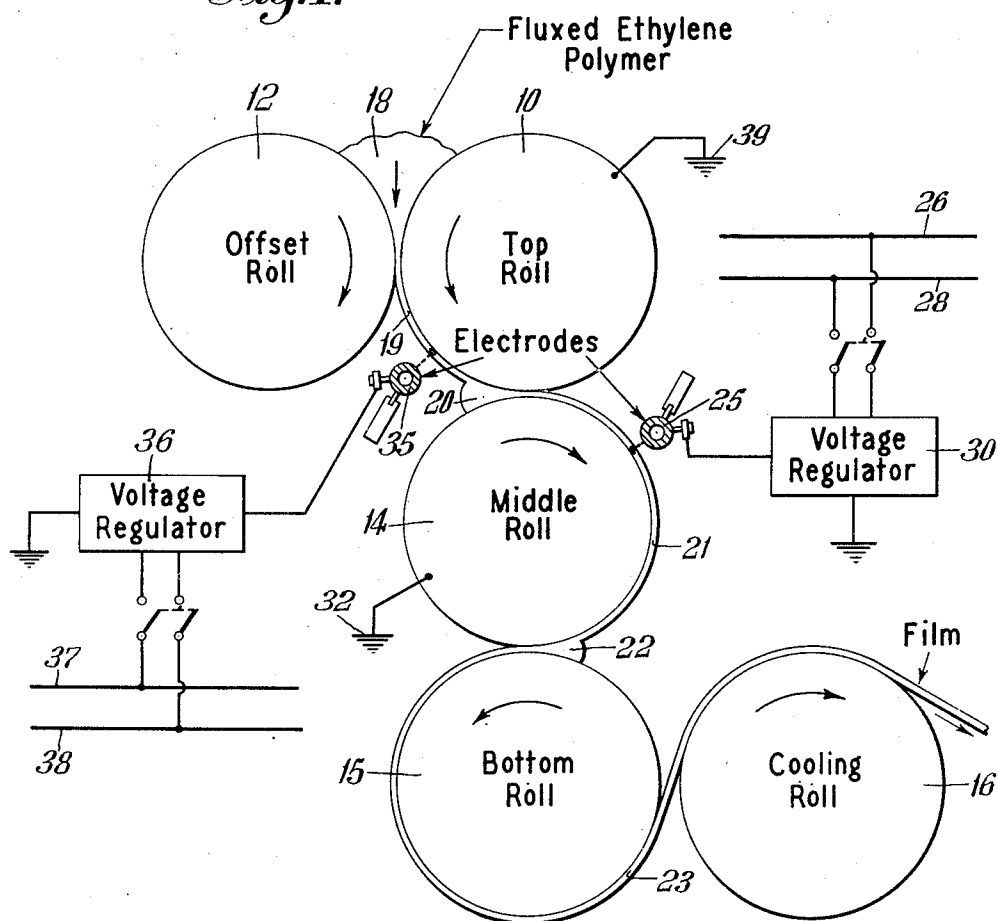
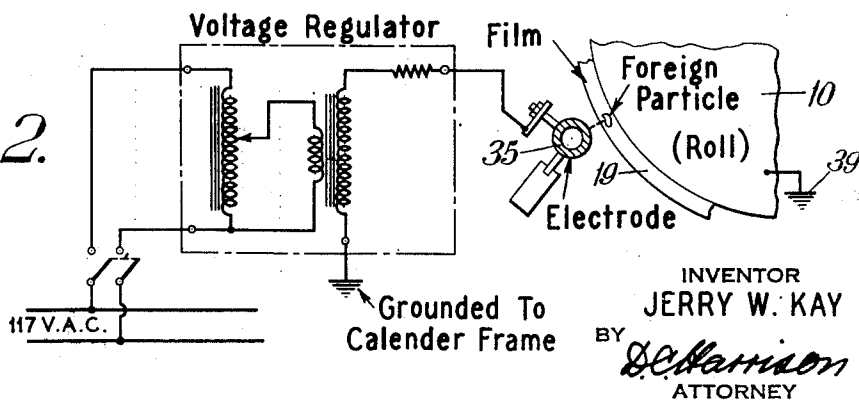


Fig. 2.



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PROCESS FOR REDUCING WEAK SPOTS IN
CALENDERED FILM

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7 Claims. (Cl. 18—2)

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This invention relates to processes for reducing weak spots in calendered film, and more particularly to a process of this character in which the weak spots are caused by the presence of small particles of extraneous matter in the film.

In the manufacture of various articles from plastic films, economical waste is caused by the presence of minute holes in the film of such sizes as to cause leaks. This is particularly important in pneumatic articles such as toys, because these minute holes often cannot be detected until the pneumatic article is fabricated and inflated. These holes are generally caused by the presence of small particles of carbonaceous or agglomerated material, dust, or other foreign matter, and it is the main object of the present invention to effect the removal of such particles.

According to the present invention, the film is subjected to high voltage electric potential, and thereafter subjected to a calendering step. This potential is established between an electrode and a grounded roll, and the particles in the film as they are brought between the electrode and the roll, receive a high voltage discharge there-through. This discharge burns or disrupts conductive particles in such a manner that any part thereof which remains is dispersed or dissipated in a subsequent calender bank where vigorous mixing occurs, and thereby removes the cause of a hole which would otherwise result. Thus the number of holes from such sources is eliminated or greatly reduced.

In the drawing:

Figure 1 is a diagram of apparatus according to, and for carrying out the method of, the present invention.

Figure 2 is a diagram of a modified form of the invention.

The calender shown comprises a top roll 10, an offset roll 12, a middle roll 14, a bottom roll 15, and a cooling roll 16, all suitably driven in the directions of the arrows shown. The plastic, for example fluxed ethylene polymer, is fed to the nip between the top roll 10 and the offset roll 12, forming the first bank 18.

The clearance between the top roll and the offset roll results in a predetermined thickness of plastic in the form of a crude sheet 19 being carried around by the top roll 10 to the nip between the top roll 10 and the middle roll 14. This nip between the top roll 10 and the offset roll 12 results in a second bank 20, and an intermediate sheet 21 being carried around by the middle roll 14 to the nip between it and the bottom roll 15.

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The nip between the middle roll 14 and the bottom roll 15 results in a third bank 22, and a finished film 23, which is carried around the bottom roll 15, and passes over the cooling roll 16, for delivery, winding or other treatment.

According to the preferred embodiment an electrode 25 is mounted close to and axially parallel to the middle roll 14, spaced therefrom thirty thousandths of an inch. Electric potential is supplied from lines 26—28 through a voltage regulator 30 to the electrode 25, the middle roll 14 being grounded as at 32. Suitable high voltage low amperage conditions are established, and may be alternating current potential, direct current potential, or high frequency potential. Alternating current of sixty cycle frequency is preferred as most generally available. A potential of 9500 volts for twelve mil thick vinyl resin sheeting is preferred. The potential varies with the thickness, from 20,000 volts for a fifty mil thickness, to 4,000 volts for a four mil thickness.

An additional or alternate electrode 35 is shown in the drawing, as connected to a voltage regulator 36 and lines 37 and 38. The electrical conditions are identical with those described for electrode 25, except that the potential is applied to the top roll 10 which is grounded as at 39. The electrode 35 applying potential along the top roll 10 is preferred, because there are two subsequent banks 20 as well as 22, which in succession serve to fill up any holes which might be left by the effect of the electrode 25 in disrupting the foreign particles.

On the other hand, the film on the next to last roll 21 is of more nearly the same order of thickness as results when the calendering operation is complete, and the particles thereon are therefore more completely exposed to the action of the electrode 25. Thus the electrodes 25 and 35 have respective advantages all of which can be secured by the use of the two electrodes in tandem.

As an example of the process, a sixty-six inch wide calender was equipped with a pipe electrode placed axially parallel to the third or middle roll, and spaced thirty thousandths of an inch from this roll. A potential of 9500 volts was established between the electrode and the calender. Twelve mil thick vinyl resin sheeting was produced with the calender so that the film of plastic on the third, or next to last roll was subjected to the electrical potential. Because of this potential small electrically conductive particles of foreign or agglomerated material in the web, which if allowed to remain would result in

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weak spots in the finished product, were burned or otherwise disrupted so as to reduce the number of weak spots which would remain in the sheet. Holes formed as a result of the electrical discharge through a weak spot were by the nature of the calendering process, subsequently removed in the final bank of material in the calender.

I claim:

1. Process for reducing weak spots in calendered film, which comprises subjecting the film to high voltage electric potential to burn or disrupt particles of foreign material, and thereafter subjecting the film to a calendering step to disperse or dissipate the remains of such particles, and close the holes caused by the electrical discharge.

2. Process for reducing weak spots in calendered film of vinyl resin sheeting, which comprises partly calendering the film, subjecting the partly calendered film to high voltage electrical potential to burn or disrupt particles of foreign material, and thereafter completing the calendering operation to disperse or dissipate the remains of such particles, and close the holes caused by the electrical discharge.

3. Process for reducing weak spots in calendered film of fluxed ethylene polymer, which comprises subjecting the film to high voltage electrical potential in the course of its passage through a calendering operation and before the last bank thereof, whereby particles of foreign material are burned or disrupted by electrical discharge, and the remains of such particles are dispersed or dissipated and the holes caused by the electrical discharge are closed.

4. Process for reducing weak spots in calendered film, which comprises passing the film through a series of calender banks, and simultaneously establishing high voltage electric potential between an electrode and the next to last bank, whereby particles of foreign material are burned or disrupted by electrical discharge, and the remains of such particles are dispersed or dissipated and the holes caused by the electrical discharge are closed.

5. Apparatus for reducing weak spots in cal-

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endered film, which comprises means for subjecting the film to a calendering operation, and means for subjecting the film to high voltage electrical potential during its passage through said calendering means and before the last bank thereof, whereby particles of foreign material are burned or disrupted by electrical discharge, and the remains of such particles are dispersed or dissipated and the holes caused by the electrical discharge are closed by said subsequent roll.

6. An apparatus for reducing weak spots in calendered film, in which the calender comprises a top roll, an offset roll and a subsequent roll, the improvement which comprises an electrode mounted axially parallel to the top roll closely adjacent to the film thereof, and means for establishing electrical potential between said electrode and said top roll, whereby particles of foreign material are burned or disrupted by electrical discharge, and the remains of such particles are dispersed or dissipated and the holes caused by the electrical discharge are closed by said subsequent roll.

7. Apparatus for reducing weak spots in calendered film, in which the calender comprises a top roll and a subsequent roll, the improvement which comprises an electrode mounted axially parallel to said subsequent roll and closely adjacent to the film thereon, and means for establishing electrical potential between said electrode and said subsequent roll, whereby particles of foreign material are burned or disrupted by electrical discharge, and the remains of such particles are dispersed or dissipated and the holes caused by the electrical discharge are closed by said subsequent roll.

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