Nov. 2, 1937. E. KINSELLA 2,097,593

APPARATUS FOR THE MANUFACTURE OF SHEET MATERIAL

Filed Jan. 20, 1934

FIG_1_

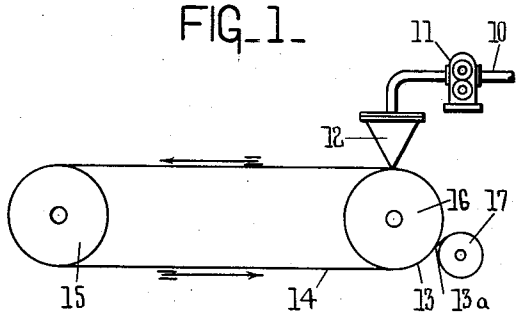
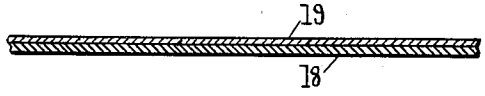


FIG_2_



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APPARATUS FOR THE MANUFACTURE OF SHEET MATERIAL

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Application January 20, 1934, Serial No. 707,465
In Great Britain January 24, 1933

4 Claims. (Cl. 18—15)

This invention relates to the manufacture of artificial materials, and in particular to the manufacture of artificial films, or foils, especially of thin foils suitable for use as wrapping paper, electrical insulation or other purposes.

The manufacture of such foils is effected by depositing a thin layer of a solution of the base material of the foil in any suitable solvent liquid on to a smooth surface, causing the thin layer to set and thereafter stripping the foil from the surface. Setting of the solution may be effected either by evaporation or by coagulation, the former usually being resorted to where the base material of the foil consists of cellulose acetate, cellulose nitrate or other derivatives of cellulose such as other esters of cellulose or cellulose ethers, and the latter, the wet method, being usually employed where the foil is of a cellulosic character, in which case a viscose or cuprammonium solution is generally employed.

The present invention is particularly concerned with apparatus in which the solution is deposited upon an endless metal band, the principal object of the invention being to provide a band capable of receiving and maintaining an exceedingly highly polished surface. According to the invention such a band consists of a base of a metal which is capable of being flexed repeatedly without deterioration in its continued passage through the apparatus, and a plated surface consisting of a metal having a high degree of hardness and capable of being highly polished. Apart from the plated surface being of a hard character so as to resist the wearing action exerted by the repeated stripping of the set foil from it, it should also be resistant, chemically and physically, to the various influences to which it is subjected. In particular, it should be resistant to corrosion by the spinning solution, and resistant to the effect of moisture.

The tough base metal, by being capable of repeated flexing, remains elastic under the working tension imparted to the band, and so does not allow deterioration of the plated surface to take place as would be the case if permanent lengthening of the band occurred.

Preferably the same metal is used for the base material as for the plated surface in order to ensure that the surface is well secured to the base and its adhesion is not likely to become impaired during use of the band. Thus, the base material may consist of a cold-rolled nickel band which is jointed in such a manner that the whole length of the band is substantially uniform as regards its physical properties, especially as regards its ability to withstand flexing, and the plating also of nickel.

The following indicates the general steps to be followed in the production of such a base band.

A band of suitable length is rolled to roughly the width and thickness required, and is then thoroughly annealed. Its ends are perfectly cleaned in readiness for jointing, which is effected by hammer welding in a reducing atmosphere at a relatively low temperature, say, 200° below the melting point. In this way the joint is effected without the danger of warping, which is present if high temperatures are employed for the purpose. The welded band is then subjected to a cold-rolling process which brings it, including the joint, to the desired final thickness and hardness, this operation being carried out carefully to leave the band as straight as possible. Slight stretching may then be resorted to in order to make the band run true and straight. This may conveniently be effected on a pair of drums which can be forced apart while being rotated to subject the whole band to the stretching tension. Nickel bands produced in this way have a very considerable tensile strength, e. g. approximately 130,000 lbs. per square inch of cross-section.

On the band thus prepared a layer of nickel is deposited in such a manner as to impart a very hard surface to the band. For example, by plating by means of electro-deposition the surface of the band may be given a hardness represented by a Brinell figure of 350 to 375, which is considerably higher than that of the base band, although the Brinell figure of 114 or so obtained by the cold working operation shows that the base band itself is of a hard character.

The plated surface is highly polished, this operation being carried out with great care since the minutest imperfections of the depositing surface are reproduced in the foil.

Bands made as above described may be used in any desired length in accordance with the amount of drying run required for the particular thickness or character of foil, or the speed at which the machine is to be run.

A suitable construction of machine, including means for applying the working tension to the band, is described in U. S. application S. No. 651,159 filed 11th January, 1933.

The principal elements of a machine of this type embodying the invention are shown by way of example in the accompanying drawing, wherein

Fig. 1 represents the general lay-out of the apparatus; and

Fig. 2 shows in detail the construction of the metal band.

Referring to Fig. 1, liquid film forming composition is supplied by means of a pipe 10 to the pump 11 which delivers it into the distributing box 12. This distributes it in the form of a layer of substantially uniform thickness upon the endless metal band 14, which passes round drums 15 and 16 by the former of which it is driven in the direction shown by the arrows. In its passage from the distributing box 12 to the point 13 the film-forming material is subjected to an evaporative atmosphere which drives off the solvent leaving the material in the form of a film or foil 13a which is stripped from the belt by the stripping device 17 round which the material passes on its way to a spool which is not shown in the drawing.

In Fig. 2 18 is the base layer of the belt formed of flexible cold hammered nickel, and 19 is a hard layer of nickel deposited upon the base electrolytically and highly polished.

Though the tensioned band in making its passage through the machine from the depositing hopper or other device through the setting run to the stripping point is caused to bend repeatedly round the supporting and driving rolls, the tough nature of the base material enables this flexing to take place without the band becoming permanently extended, so that the danger of the polished surface becoming broken as would be the case were a soft metal band used is avoided, and the high polish which the hard nickel surface is capable of receiving is maintained for long periods.

What I claim and desire to secure by Letters Patent is:

1. An endless band for the manufacture of artificial films, foils and like materials comprising a metal in two different physical states and having a basic layer of the metal in one state in which it is capable of being flexed repeatedly without deterioration and a superficial electrodeposited plating of the same metal which is very hard and capable of taking a high polish.

2. An endless band for the manufacture of artificial films, foils and like materials comprising nickel in two different physical states and having a basic layer of nickel in one state in which it is capable of being flexed repeatedly without deterioration and a superficial plating of nickel which is very hard and capable of taking a high polish.

3. An endless band for the manufacture of artificial films, foils and like materials comprising nickel in two different physical states and having a basic layer of nickel in one state in which it is capable of being flexed repeatedly without deterioration and a superficial electrodeposited plating of nickel which is very hard and capable of taking a high polish.

4. An endless band for the manufacture of artificial films, foils and like materials consisting of two firmly united layers, one layer consisting of cold rolled nickel and capable of being flexed repeatedly without deterioration and the other consisting of a plating of nickel which is very hard and capable of taking a high polish.

EDWARD KINSELLA.