Dec. 18, 1945. G. T. LANE 2,391,171

PHOTOGRAPHIC STRIPPING FILM

Filed June 7, 1941

FIG. 1

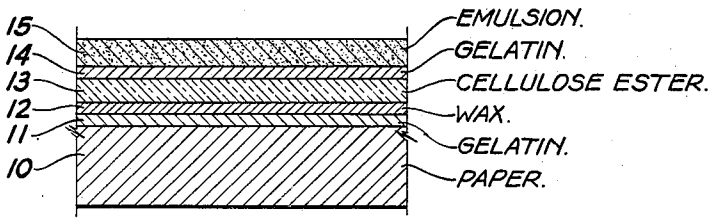
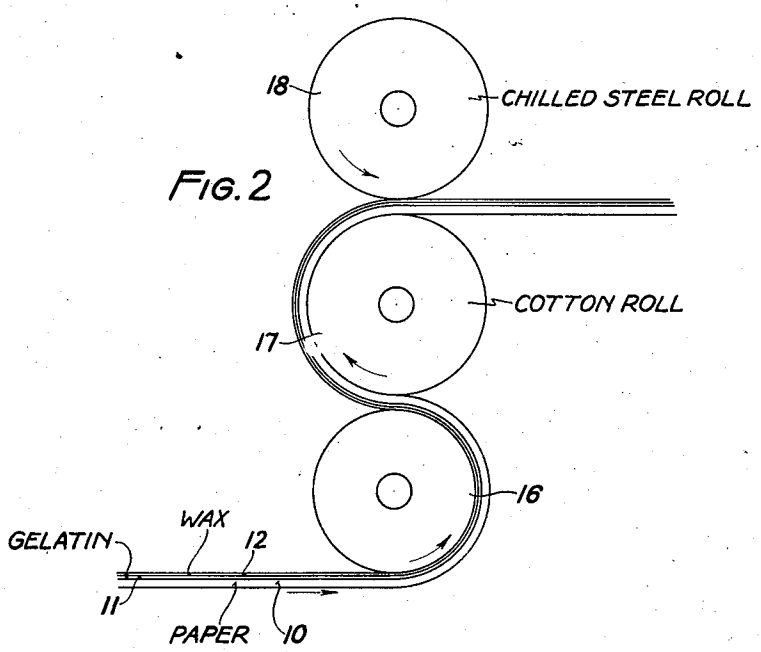


FIG. 2



GEROULD T. LANE
INVENTOR

Newton M. Perkins

BY R. Frank Smith

ATTORNEYS

Patented Dec. 18, 1945 2,391,171

UNITED STATES PATENT OFFICE

2,391,171

PHOTOGRAPHIC STRIPPING FILM

Gerould T. Lane, Rochester, N. Y., assignor to Eastman Kodak Company, Rochester, N. Y., a corporation of New Jersey

Application June 7, 1941, Serial No. 397,093

4 Claims. (Cl. 95—9)

This invention relates to photographic material and particularly to a photographic stripping film.

Photographic stripping film is generally understood as being a photographic material in which one portion is stripped from another portion before or after the formation of a photographic image in the sensitive layer of the material. It is frequently desirable that the portion of the film carrying the photographic image be as thin and as flexible as possible, and in order to support this portion during some of the manipulative operations, it is attached to a temporary support of film or paper.

Most photographic stripping material can be separated only in the wet state, or if it is separable in the dry state, is of complex nature and expensive to manufacture. Dry stripping photographic material has not hitherto been widely used because of the difficulty of obtaining satisfactory and economical material.

It is therefore an object of the present invention to provide a dry stripping photographic material having satisfactory properties for use in the photographic trade. A further object is to provide a simple photographic stripping material which can be made economically. Other objects will appear from the following discussion of my invention.

These objects are accomplished by applying to a suitably sized photographic paper stock a wax layer which is calendered to a smooth surface, and applying the permanent support of the stripping film to this calendered wax layer.

In the accompanying drawing Fig. 1 is a sectional view of a stripping material made according to my invention (the various layers not being in proportion as to thickness) and Fig. 2 is a view partially in section showing the method of calendering the wax surface of the temporary support preparatory to coating the permanent support on it.

In its broad aspects my invention comprises applying a wax layer to a sized paper support such as raw photographic paper stock and calendering the wax layer to a smooth surface. To this temporary support a thin layer of a film forming material such as cellulose ester is applied. This permanent support is coated with a suitable gelatin sub and on the subbed surface a light-sensitive photographic emulsion is coated. This film carrying the emulsion may be stripped from the waxed paper support after the emulsion has dried or it may be stripped at a later time and cemented temporarily or permanently to any flat surface such as a glass, metal or wood surface. The emulsion may be exposed before or after the permanent support is stripped from the wax layer.

A preferred form of my invention comprises a temporary base of photographic paper stock sized with gelatin and coated with a water emulsion of carnauba wax. The wax surface is calendered to a smooth finish and a coating of cellulose nitrate solution is applied. This permanent support is subbed and emulsion coated with a light-sensitive photographic emulsion of the desired type.

The various aspects of the preferred form of my invention will now be described in greater detail.

The temporary base may be an ordinary glossy double-weight photographic paper stock. It should have a limited amount of fuzziness so that the paper fibers do not penetrate the gelatin and wax coatings later applied and prevent even stripping.

The gelatin coating applied to the paper base may consist of a gelatin solution containing approximately 7% gelatin and having 36 grains of chrome alum crystals added per pound of gelatin. This gelatin solution may be applied by brush application at 120° F. and at this concentration the coverage is about 2½ grams of gelatin per square meter of paper surface. Concentrations of gelatin solutions as low as 5% have been used which have given satisfactory results. However, extremely low concentrations, for example those which give a coverage of 0.3 gram of gelatin per square meter of paper, are not satisfactory. Higher concentrations are inclined to produce curl in the paper. The object of the gelatin coating is to cover the surface fibers of the paper evenly to prevent their sticking into the wax layer and into the permanent cellulose nitrate support since this would increase adhesion between the layers and cause uneven stripping.

The wax coating is prepared from an emulsion in water of a suitable wax such as carnauba wax. This is applied over the gelatin coating with the brush type application at room temperature. The emulsion of carnauba wax is prepared by adding 30 pounds of wax to 300 pounds of water just at the boiling point. When it is melted 1.16 pounds of sodium hydroxide are added with constant stirring. The emulsion is then put through a colloid mill and further diluted with 200 pounds of water. The finished emulsion is approximately 6% wax and has a coverage of

about 1.8 grams of wax per square meter of paper surface. A coverage as low as ⅓ of this amount gives poorer results and somewhat higher concentrations leave an accumulation of wax on the calender rolls.

The purpose of the wax coating is to provide a surface sufficiently incompatible with the nitrocellulose permanent support so that the permanent base may be stripped from it. The wax layer, however, must be calendered before applying the cellulose nitrate to it. If the nitrate coating is applied to the wax surface uncalendered, the stripping results are unsatisfactory. Adhesion is greater on some portions of the surface than on others presumably because of the difficulty in securing an absolutely uniform spread. This inequality in adhesion leads to tearing the thin permanent support during the stripping operation.

The calendering operation is carried out by passing the paper having the wax coating down, between a cotton roll and a chilled steel roll; the chilled steel roll faces the wax surfaces and runs at a speed about 2½ times the speed of the cotton roll. This operation levels out the wax surface and provides uniform ease of stripping. It is at this point that the excess of wax would appear as an accumulation on the steel roll and prevent a satisfactory polishing of the surface. It is essential, therefore, that the amount of wax should be kept within proper limits.

The permanent support which carries the sensitive emulsion is preferably a plasticized cellulose nitrate layer. The preferred thickness of this support is about .0004 inch although it may be as low as .0003 inch. A suitable nitrate would be one which has an alcohol solubility of 30 to 100%, a viscosity of 2 to 5 seconds (dropping ball method) and a nitrogen content of 11 to 12%. This is applied as a 6–7% solution in a solvent mixture comprising 85% methyl alcohol and 15% acetone to which has been added 25% of the weight of the nitrocellulose of castor oil. Application is preferably made to the waxed support from an immersion type hopper. It is highly desirable that this permanent base be as thin as possible in order to bring the photographic image on the finished material as close as possible to final support on which the material is applied.

The gelatin sub applied to the cellulose nitrate base may be a sub of the usual type having the following composition:

	Per cent
Gelatin	1
Water	10
Acetic acid	0.5
Methyl alcohol	88.5

The emulsion applied as a final coating may be of any suitable type but is preferably a high contrast superspeed gelatino silver halide emulsion to which has been added starch as a matting material. This matting material enables the image to be retouched or altered either with a pencil or with a pen. The matting material is used in an amount of about ⅓ ounces in a quantity of emulsion covering 400 square feet of surface. Amounts of from ¼ ounces to 2 ounces on 400 square feet of surface are satisfactory, but excess amounts are inclined to cause brittleness in the emulsion.

My invention will now be described by reference to the accompanying drawing.

As shown in Fig. 1, 10 represents the temporary paper support having thereon the gelatin sizing layer 11 and the wax layer 12. Over the wax layer there is a cellulose ester permanent support layer 13 followed by a gelatin subbing layer 14 and the emulsion layer 15.

Fig. 2 illustrates the method of calendering the wax coating. As shown therein the paper 10 containing the gelatin coating 11 and wax layer 12 is passed in the direction indicated by the arrows between a set of rolls. The roll 16 is an idler roll which keeps the material in contact with a cotton roll 17. Passing around the roll 17 the material comes in contact with a chilled steel roll 18 which rotates at about 2½ times the speed of the cotton roll 17. The wax surface 12 is in contact with the chilled steel roll 18 and since the roll 18 moves more rapidly than the material passing beneath this roll, the wax surface is spread and calendered to a high degree of smoothness.

By the selection of the proper concentrations of the various solutions, it is easily possible to prepare a material which has the right degree of adhesion between the various layers. It is by using gel and wax layers of the proper thickness and by the polishing technique outlined above that correct stripping characteristics may be obtained.

The stripping material prepared according to my invention separates cleanly from the permanent support without preliminary softening or without tearing or distortion of the film. This material may be used in the photomechanical arts or it may be used as a mask layer when applying to multi-layer colored film. It also finds application in the automotive and aircraft industries for the preparation of templates. When used in this way the stripped material may be applied to a material used in the production of templates, emulsion side down or base side down. It may be necessary to provide a suitable adhesion layer for affixing the stripped material to the metal or other material from which the template is made. The stripped material may be exposed before or after application to a metal sheet in this way.

The use of my material in the preparation of templates makes it desirable that the stripped material be as thin as possible. I find that a highly desirable film made by my process has a thickness of approximately .0006 to .0009 inch. The controlling minimum is the thickness below which materials cannot be handled when transferring is made. The plasticizer such as castor oil in the film base is important in order to prevent separation at the edges of the cut during cutting or punching of the template. Unplasticized materials not only separate but appear to retract from the edges of the cuts.

The material prepared according to my invention may be used in other ways not herein specifically mentioned and it will be understood that my invention is to be taken as limited only by the scope of the appended claims.

What I claim is:

1. A photographic dry stripping film consisting, in order, of a paper temporary support having a gelatin coating thereon, a calendered wax layer consisting of approximately 1.8 grams of wax per square meter of paper surface, a cellulose nitrate permanent support, a gelatin sub, and a sensitive emulsion layer.

2. A photographic dry stripping film consisting, in order, of a paper temporary support having a gelatin coating thereon, a calendered carnauba wax layer consisting of approximately 1.8 grams of wax per square meter of paper sur-

face, a cellulose ester permanent support, a gelatin sub, and a sensitive emulsion layer.

3. A photographic dry stripping film consisting, in order, of a paper temporary support having a gelatin coating thereon, a calendered carnauba wax layer consisting of approximately 1.8 grams of wax per square meter of paper surface, a cellulose nitrate permanent support, a gelatin sub, and a sensitive emulsion layer.

4. The method of making a photographic stripping paper which comprises coating a layer of gelatin on a paper support, emulsifying a proportion of approximately 30 pounds of carnauba wax in approximately 300 pounds of water to produce an emulsion containing approximately 6% wax and coating the emulsion on the gelatin layer, calendering the resulting wax layer to render it smooth, applying a layer of plasticized cellulose nitrate to the calendered wax layer, and applying a gelatin sub and an emulsion layer to the cellulose nitrate layer.

GEROULD T. LANE.