

UNITED STATES PATENT OFFICE

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COMPOSITE SHEET

No Drawing.

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This invention relates to improved composite sheets and the process of making the same.

One of the objects of my invention is the provision of a composite sheet which is especially adapted for use in the making of playing cards and similar articles where the use of the article is subject to considerable wear, and thus producing an article which can be subject to considerable usage without destruction and the breaking and cracking of the edges thereof, which is usually the case with playing cards, and the like, in use at the present time.

Another object of this invention is the process of making a composite sheet which consists of impregnating the paper stock with a suitable potentially reactive resin, such as the phenol formaldehyde condensation product, urea formaldehyde, furfural phenol, or the like, then sheeting the stock into paper and coating the same with a white or light colored pigment on one or both sides to produce a printing surface, and after the printing has been applied to the surface, the product is then coated with the same or another potentially reactive resin and subsequently formed under heat and pressure. While it is not necessary to coat the surface after printing with a resin, it has been found advantageous in protecting the surface from wear.

In carrying out the process of producing an improved composite sheet which is particularly applicable to articles, such as playing cards and articles which have to have the printing lined up on the two sides, I prefer to impregnate paper stock during the making thereof with a suitable potentially reactive resin by placing the resin in with the stock while it is in the "Hollander" or beater engine, so as to thoroughly mix the resin with the paper stock, and after it has been thoroughly impregnated in the stock, the stock is then sheeted to any desired thick-

ness which may run anywhere from .004" to .030".

The sheeted product is then coated with a white or light colored pigment on one or both sides in order to obtain both a light colored product and a printing surface. This coating is applied by passing the sheeted paper through a paper coating machine, as if coating regular paper stock, and the printing surface obtained by subsequently calendaring. After the above surface has been applied to the paper, the same can have printed thereon any suitable indicating characters, lettering or half tone effect as in color printing up to and including 175 lines per inch, and after the printing has been done, the article is then coated with a similar or another suitable resin in the form of a resin varnish or solution. As previously stated this coating is not essential, but advantageous, and subsequently formed under heat and pressure.

A variation of the above process would be to impregnate paper after its manufacture with a resin solution, dry to drive off the solvents, and then the subsequent operations of coating, printing, finishing, and forming.

Attention is directed to the fact that after the paper has been rolled and coated with a pigment and calendered to produce a printing surface, the paper sheets can be cut into the desired size before the printing is done, or the printing may be done as a whole with the printing arranged in sections thereon, so that the sheets can be cut to the proper size, after the printing has been done, and it will also be apparent that the surface coat of resin can be applied to the material either before or after cutting. It has been found advantageous to cut the calendered paper into sheets and after printing to use a varnishing machine as is common in the print finishing industry, so that a uniformly thin coating of resin may be applied. After ap-

plying the surface coat of resin, the articles which are now in sheet form are placed in a press between polished plates and heat, and pressure applied thereto, in order to produce the finished surface. By impregnating the sheets throughout by one of the previously mentioned methods so that in the case of playing cards, the edges are protected during the use of the cards, so as to reduce the wear on the edges thereof and prolong the life and usefulness of the cards.

In applying the resin to the paper or paper stock, any suitable amount can be used in accordance with the finished stock desired, but for the purpose of illustration, attention is directed to the fact that a filler containing from 15% to 75% resin is applicable for producing finished products ranging from .004" to .030" in thickness.

The main purpose of this invention is to produce a composite sheet which is impregnated throughout with the potentially reactive resin, which has a light colored printing surface on both sides, so that perfect register can be obtained and the finished article will withstand considerable wear on the article itself and retain the article in shape for a long period of time.

Cards or similar articles produced by this process will stand considerable wear and will hold their shape a greater length of time than the ordinary playing cards in use at the present time. This process is applicable to decorative advertisements, art reproductions for use without glass protection, and other articles of this class.

In the present process of making playing cards, it is necessary, in order to impart the proper snap and crispness, to use laminated paper stock which is glued or pasted together. While the process disclosed in this invention is a very simple one, it is believed that the application of this process to the manufacture of playing cards, and the like, will not increase the cost of manufacture, but at the same time will produce an article which is superior to those on the market at the present time, being quite free from tendency to warp, will not fray or open on the ends and edges, remains permanently crisp, as compared with laminated paper, it is relatively unaffected by moisture, is very resistant to ordinary chemicals, it may present smooth and plane surfaces, or it may be compressed with any desired configuration or design, and any desired design may be printed in offset, lithographic, letter press or four color process which does not require a greater fineness of design than 175 lines per inch.

I claim:

That step in the process of forming playing cards or similar paper sheets, which consists in impregnating paper stock with a potentially reactive resin, sheeting the impregnated stock, coating the sheeted stock with

a pigment, then calendering the coated stock to form a printing surface, printing the calendered sheets, applying a finishing coat to the printed surface, and finally applying heat and pressure to the sheets.

In testimony that I claim the foregoing I have hereunto set my hand at Milwaukee, in the county of Milwaukee and State of Wisconsin.

MARSHALL R. HOWARD.