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ART OF PRINTING AND EMBOSSGING AND APPARATUS FOR PERFORMING THE SAME

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ORIGINAL
SUBJECT

STEP-I-

FILTER

NEGATIVE 1ST COLOR

NEGATIVE 2ND COLOR

NEGATIVE 3RD COLOR

EMBOSSING ROLL NEG.

STEP-II-

STEP AND REPEAT CAMERA

STEP-III

EXPOSE CARBON SHEET FOR EACH NEGATIVE

STEP-IV

APPLY CARBON SHEETS TO ROLL & EXPOSE

STEP-V

ETCH ROLLS

STEP-VI

1ST COLOR ROLL

2ND COLOR ROLL

3RD COLOR ROLL

EMBOSSING ROLL

BACKUP ROLL

BACKUP ROLL

BACKUP ROLL

BACKUP ROLL

MOUNTING RESULTING INTAGLIO PRINTING ROLLS & EMBOSSGING ROLL IN A PRINTING & EMBOSSGING MACHINE TO REGISTER OPERATIONS ON A TRAVELING WEB & CARRY OUT THESE OPERATIONS IN SEQUENCE ON SUCH WEB.

INVENTOR.

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BY

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This invention relates to the printing and embossing of a traveling web by continuously rotating rolls. The web is first printed with designs or other characters in black and white or in one or more colors, and such characters are thereupon embossed to produce three-dimensional effects.

The invention is susceptible to the printing and embossing of materials of various kinds, to be used in the making of a wide variety of articles of manufacture, but is primarily intended for use in the manufacture of shelf papers, shelf edgings, decorative wrappers, labels for cans, boxes, etc.

The objects of this invention are to provide a simple, economical and efficient method and means for printing and embossing a traveling web in such manner as to obtain remarkably fine registration between the printing and embossing on said web.

I have discovered that it is possible to attain the foregoing objects, and others, by preparing companion printing and embossing rolls, i.e., both the printing and cooperating embossing rolls, by identical photo-etching processes. For example, if it be assumed that a design is to be reproduced in three color printing by intaglio gravure process, with embossing, I preferably proceed as follows:

There is first prepared the original copy which, for the purpose of illustration, may be an artist's drawing or layout of the design. For a three color job I take from the copy four photographic negatives—one for each color roll and one for the embossing roll. For the color roll negatives I employ appropriate color filters, but for the embossing roll negative, no filter is used.

Next, I retouch all of these negatives. The retouching on the color roll negatives is to sharpen them and to improve or correct loss of depth in shadows and of brilliancy in high lights. In the embossing roll negative, I retouch those portions which correspond to the embossing desired on the web, or optionally those portions which correspond to the portions of the web not to be embossed.

Now that I have the finished negatives, it is a simple matter to put all of these negatives through a "step and repeat" camera in succession to produce a positive of each one, which will embody a sufficient number of repeats required by the circumference and length of the printing and embossing rolls to be used.

After these positives are completed, each is interposed between an appropriate light source and conventional carbon tissue, as commonly employed in the preparation of gravure cylinders and comprising a sensitized gelatin film on a paper backing sheet, so that a carbon sheet is exposed for each negative. These several carbon sheets are thereafter applied or transferred to the corresponding color printing and embossing rolls by the conventional gravure technique and developed and the rolls are etched in the usual manner of preparing gravure printing rolls. This is the well known gravure technique and in performing it with respect to the color rolls, the usual screens are employed. A screen may be used with respect to the embossing roll to produce certain effects, but it is not necessarily required.

The four rolls thus produced are mounted in and form part of a printing and embossing apparatus, through which the web to be decorated is caused to continuously travel into contact with said rolls in succession. These rolls are driven at the same surface speed and act upon the web, while the latter is backed up by rolls opposing the respective printing and embossing rolls, to hold the web against such latter rolls. The back-up rolls may be smooth surfaced rolls, but for the one which cooperates with the embossing roll, I prefer to use one having a surface supplementary to the surface of the embossing roll, so as to have a male and female relation therewith. This back-up roll may, however, have a smooth surface resilient in character.

By the foregoing method I produce by identical steps, printing and embossing rolls wherein the corresponding motifs on the several rolls are identically positioned for very remarkable registration when acting upon a traveling web in succession. This is in pronounced contrast to the practices heretofore carried out in this art.

Customarily printing and embossing on a traveling web has been accomplished either by depositing ink upon the embossing roll before it contacted the web, or upon the back-up roll before the web passed between said rolls. Broadcast embossing simulating linen and other overall designs have also been applied to printed matter, but no registering between the printing and the embossing was obtained and the design was of a coarse construction.

Embossing has also been carried out in the past with some degree of registration by laying ink in predetermined places upon a web in advance of an embossing roll by what is known as surface printing and thereafter embossing the web. This procedure merely placed daubs of ink
generally conforming to the embossed design, but it never permitted of the expression of contours or fine lines, shading, over-printing, color art work, or process printing, such as may be accomplished by embossed intaglio printing according to the present invention. Hence the only semblance of three dimensional effects has been possible by slight embossing on solid blocks of ink as hereinafter stated. The reason for this is that these printing and embossing rolls were generally hand engraved or chased and therefore could not accomplish the very fine quality of art work which I produce by photographic methods of the intaglio process described.

Furthermore it has not been commercially possible to produce the rolls of the prior art due to the great amount of highly skilled labor and time involved and it is practically impossible to manually place intricate and numerous motifs in proper relation required for registration of continuous printing and embossing operations. This is particularly true with large output units where the web is often quite wide. The time and tedious labor required to engrave such rolls is stupendous.

However, by the present invention, employing photographic transfer followed by etching all of the rolls, as hereinafore described, this work may be done quite simply. There need be no concern about intricate designs because the same may be accomplished without any additional effort, although at times it may be desirable with some designs to manually complement the etched embossing roll by hand tooling. Nevertheless, any hand tooling thus employed does not interfere with the placement of the motif parts of the design on the embossing roll.

By the method of this invention all of the rolls are made easily and at the same time, by the same process of reproduction and the work completed at minimum time and expense.

It will be apparent from the foregoing that the invention comprises several novel features among which may be enumerated: the process which comprises producing companion etched printing and embossing rolls by reproducing the copy upon both the printing and embossing rolls by the same type of procedure; the process of preparing an embossing roll by photographically and chemically transferring copy onto said roll and subsequently etching the roll to produce depressed surface portions, with other portions of the roll surface standing out in various degrees of relief; and a printing and embossing apparatus comprising chemically etched companion printing and embossing rolls respectively coating with a like number of back-up rolls. In the apparatus, all of the printing and embossing rolls are operatively connected to rotate at the same surface speed to operate upon the web in succession, with conventional inking means for the printing rolls and other adjunct conventional to roll printing machines.

I have thus far described how this invention may be carried out in performing three color, embossed gravure decoration on a web. The invention is not, however, limited to any particular number of colors for it will appear that more or less colors may be provided by adding or subtracting color rolls and their corresponding negatives.

Moreover, if the design is to be printed in black and white, i.e., without color, only one printing roll will be required. In this case, only one photographic negative need be taken from the copy, for the positive for the preparation of the printing roll may be taken from this negative and the negative thereafter retouched for the embossing roll in the manner hereinafter described, to provide for the embossing desired.

Moreover, instead of using a single embossing roll as described, I may, if desired, provide one or more additional embossing rolls, produced in the same manner as hereinafore described and I may mount these additional embossing rolls in the apparatus, to be operated in sequence with the printing rolls and single embossing roll already described. The invention is thus not limited to the use of a single embossing roll, although one is sufficient for most jobs, with a back-up roll either resilient or not as desired.

For an illustrative graphic showing of the preferred form of the method of this invention, reference is made to the accompanying drawing. Here consecutive steps of the method are indicated with legends, starting with the "original subject" and carrying through the final step of printing and embossing a traveling web in register.

The foregoing detailed description sets forth the invention in its preferred practical forms, but the invention is to be understood as fully commensurate with the appended claims.

Having thus fully described the invention, what I claim as new and desire to secure by Letters Patent is:

1. The method of producing an embossed printed web, which comprises: photographically reproducing a subject onto at least one intaglio printing roll, photoengraving predetermined portions of the surface of an embossing roll correlated with the portions of the web which it is desired to emboss, and thereafter coating the resulting rolls in succession directly with a moving web with the corresponding printing and embossing portions thereof in predetermined correlation.

2. The method of producing an embossed printed web, which comprises: photographically reproducing a subject onto at least one intaglio printing roll, photographically reproducing onto an embossing roll at least that portion of the subject which it is desired to emboss, with the reproductions on said rolls at the same scale and correspondingly positioned, chemically etching all of said rolls, and thereafter coating the resulting rolls in succession directly with a moving web with the corresponding printing and embossing portions thereof in register.

3. The method of producing an embossed printed web, which comprises: photographically reproducing a subject onto at least one intaglio printing roll, photographically reproducing onto an embossing roll at least that portion of the subject which it is desired to emboss, with the reproductions on said rolls at the same scale and correspondingly positioned, chemically etching all of said rolls, and thereafter coating the resulting rolls in succession directly with a moving web
with the corresponding printing and embossing portions thereof in register.

5. The method of producing an embossed printed web, which comprises: photographically reproducing a subject onto at least one intaglio printing roll, photographically reproducing the subject onto an embossing roll with the included step of retouching at least one of the photographic transparencies employed to impart to the embossing roll when the latter is etched depressed surface portions from which other surface portions stand out in relief therefrom, chemically etching both the printing and embossing rolls, and thereafter coating the resulting rolls in succession directly with a moving web with the corresponding printing and embossing portions thereof in register.

6. A web printing and embossing apparatus comprising: at least one etched intaglio printing roll, and at least one etched embossing roll, all of said rolls being connected together to be driven at the same surface speed with at least portions of the design on said rolls in register.

7. The method of producing an embossed printed web, which comprises: photographically reproducing a subject onto at least one intaglio printing roll, photoengraving predetermined portions of the surface of an embossing roll correlated with the portions of the web which it is desired to emboss, thereafter tooling said roll, and thereafter coating the resulting rolls in succession directly with a moving web with the corresponding printing and embossing portions thereof in predetermined correlation.

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