Aug. 23, 1938. J. J. TIGHE 2,128,105

RELIEF PRINT

Filed July 30, 1934

Fig. 1.

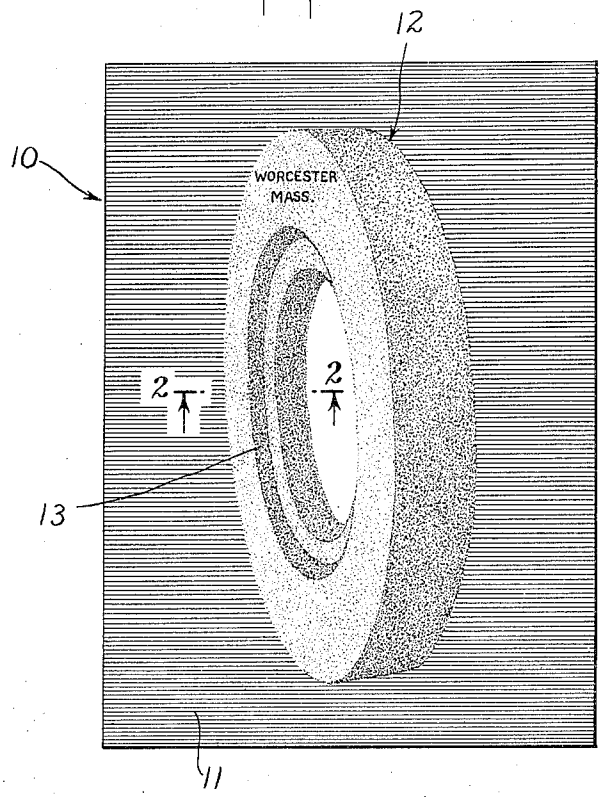
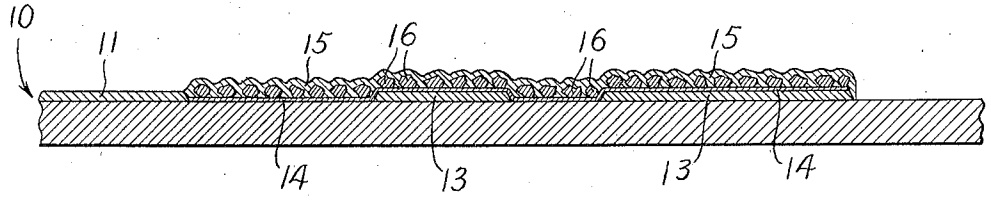


Fig. 2.



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RELIEF PRINT

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8 Claims. (Cl. 41—24)

The invention relates to prints, lithographs, and rotographs, including ink or color impressions and similar productions, and with regard to its more specific features to the simulation of an abrasive, such as a grinding wheel, in a picture.

One object of the invention is to provide an efficient printing process whereby finely divided matter may be incorporated with a printing ink. Another object of the invention is to provide a process for attaching comminuted matter, for illustrative purposes, to a sheet of paper. Another object of the invention is to unite comminuted matter such as crystal grains to paper together with inks in various shades in order to make a more realistic picture of an article than can be achieved by inks or photographic process alone. Another object of the invention is to provide an efficient and reliable process of the nature referred to. Another object of the invention is to produce a printed sheet presenting an extremely realistic picture of an article having a roughened, reflective, or gritty appearance. Another object of the invention is to provide an illustration incorporating comminuted matter held in place by a transparent or translucent binder which may be superimposed over a first printing to produce a detailed picture. Other objects will be in part obvious or in part pointed out hereinafter.

The invention accordingly consists in the features of construction, combinations of elements, arrangements of parts, and in the several steps and relation and order of each of said steps to one or more of the others thereof, all as will be illustratively described herein, and the scope of the application of which will be indicated in the following claims.

In the accompanying drawing, in which is shown one of various possible embodiments of the mechanical features of this invention,

Figure 1 is a picture of a grinding wheel to illustrate my process and the print or impression produced thereby;

Figure 2 is a cross-sectional view through a sheet of paper having the picture of Figure 1 produced according to my novel process thereon, with the parts greatly magnified and without being drawn to exact scale.

Similar reference characters refered to similar parts throughout the several views of the drawing.

In performing the process of my invention I set up a printing press to produce a background on the paper which is to be printed. This background may be any picture, with or without words, and produced according to any known printing process. Referring now to Figures 1 and 2, a piece of paper which has been put through the press is indicated at 10, and has superimposed thereon a general background 11 which may be plain or may include a picture or words. The picture which is more particularly the subject matter of the invention is generally designated at 12 and in this embodiment is a grinding wheel. The original or first printing or background includes dark places 13 which represent the shading or darker surfaces in the picture of the grinding wheel.

Having produced the desired number of sheets by printing the background 11 and the shaded parts 13 on an ordinary press, or having produced the same kind of a picture by means of a rotogravure process or the like, the sheets 10 are ready for the second part of the process. The press is again set up, but this time with merely a flat tint plate which is exactly the size and shape of the area of the outline of wheel 12 in the ultimate picture in the press to contact with that part of each sheet which is to have the picture of the wheel. This press is then run and the tint plates are inked with an ink adapted to withstand high temperatures such as are used in the later part of the process as hereinafter described. The ink used in the press for the second or tint plate printing may be transparent, white, red, gray or any desired color, and the pigment used, if any, is preferably a dry pigment in any color, or carbon or lamp black for the darker shades, and this is combined with a vehicle adapted to withstand high temperatures. The vehicle I prefer to use is a mixture of castor oil and rosin gum. Other vehicles adapted to withstand the effects of high temperatures may be used, but I note that the rosin gum has particular advantages in connection with the specific resin that I prefer to use as hereinafter specified.

The press having been set up for the second or tint plate printing, and the rollers inked with a thermographic ink of the nature specified, the sheets 10 which have had the background printing are put through the press one by one. As they come out of the press, one by one, and while the tint plate printing 14 is still wet, the sheets are sprinkled with a mixture of a comminuated binder which will melt at temperatures that will not burn the paper and a comminuted irregular hard substance. For the binder I prefer to use comminuted or powdery rosin, particularly as this, upon heating, combines very effective-

ly with the rosin in the ink. Furthermore, when melted, rosin readily flows and its viscosity is such that it forms a coating around the hard particles, and it is transparent and virtually colorless in itself and hence assumes the color of the ink. It is also very adherent, binds the entire mass including the hard comminuted substance together and holds it firmly to the paper 10. The rosin is indicated at 15 in the drawing and has embedded therein the hard comminuted particles 16.

For the latter I prefer to use grains of alumina, such as grit sold under the trade-mark "Alundum". I may, if I desire, use silicon carbide grains, such as the grit sold under the trademark "Crystolon". I may also use other crystalline grains, such as quartz or the like, and for certain embodiments of the invention other comminuted matter may be used. For the specific size of grains used in a preferred embodiment of the invention I mention a mixture of 50 per cent 90-grit grains and 50 per cent 120-grit grains.

While various proportions of the mixture of resin and hard comminuted substances may be adopted, when rosin and alumina are used I find a mixture of two parts of rosin to one part of alumina grit, by volume, to be highly desirable and efficacious in practical use. By using this proportion, the background of the picture shows through very effectively so that written matter is entirely legible through the coating, as illustrated in Figure 1. By crystalline grain I intend to define such compounds, both natural and artificial, as have a crystalline fracture and appearance to the naked eye and excluding all pure metals or alloys of metals and other substances which may be ductile and which in comminuted form do not present a crystalline appearance to the eye, although they may be crystalline in fact under the microscope. This invention is in the field of illustration and characteristics which are important relate to the appearance of the substance. Furthermore I use comminuted substances the individual particles of which can be seen and which give the abrasive appearance to the printed sheet, and finely divided materials which look like a mere powder are sharply distinguishable as their effect is merely that of a filler.

A mixture of binder and hard comminuted material having been dusted onto the sheets 10 successively, they are then tapped and shaken and the mixture will be found to adhere to the tint plate printing 14, but the mixture on the remainder of the paper will fall back into the box or other receptacle provided for the purpose. It should be noted that each sheet is dusted and then shaken right after it comes from the tint plate printing operation.

The sheets are now ready for the final heat-treatment and steps in the process which complete the article.

I prefer to carry out the printing operation on a machine having an apron which moves through a heater. I may use a machine of the type disclosed in United States Letters Patent to H. J. Smith, No. 1,025,594, and hence I have not illustrated such machine and need not describe it in detail herein. Instead of the apron comprising transverse wire rods 24 shown in this patent to Smith, I prefer to use an asbestos or canvas belt, in order to prevent the paper from being burned. Instead of a long burner tube 42 extending in the direction of movement of the apron as shown in the patent to Smith, I prefer to use a plurality of burner tubes extending transversely of the direction of movement of the apron, and instead of locating holes on the upper part of the tube or tubes, I prefer to have the flame holes on the under side of the tubes. With these changes I may use the mechanism of said Smith patent, or any other apparatus which will give the heat treatment to be described.

On the moving apron of such a machine I place the sheets treated as already described, one by one. The machine preferably has a hood such as the hood 18 of the patent to Smith, and this hood or hot box may be approximately 18 feet long. I may feed the sheets through it at the rate of about 1,000 sheets an hour. The flames are adjusted such as by a valve like the valve 45 of the patent to Smith referred to so that the flames extend down toward but do not quite touch the paper as the sheets are run through. If the final product has a rubbery surface I know that the temperature in the hot box or hood is excessive, and I maintain the heat in the hot box as high as possible without making the final product rubbery.

The temperature in the hot box should be high enough to melt the rosin and cause it to flow sufficiently to embed all of the comminuted particles. Within the limits as suggested, different temperatures may be used, and I note that very practical results have been obtained when the temperature over the burner tubes in the hot box was of the order of 400 deg. to 450 deg. Fahrenheit.

I may print pictures in different colors on a single sheet of paper at one operation of the tint plate printing process, by offsetting the tint plates so that they do not overlap and splitting the rollers that apply the thermographic ink to the tint plates. According to this method I would use a plurality of different ink boxes, for example three, containing, if desired, thermographic inks of different colors.

In the final product the picture may have the characteristics of light and dark spots, stippling, shaded areas, writing of any words, and even different colors in different parts of the same article. In other words the process is adapted to produce any desired picture at all, in any color. The picture differs from other pictures, however, in being extremely realistic in any case where it is desired to produce the effect of a broken rough surface, as the individual grains of comminuted matter, for example alumina, scatter the light and offer reflective surfaces which sparkle. Furthermore, sparkling points scatter light in all directions, so that the picture is effective viewed at any angle and effects other than the mirrorlike result of a metal plating process can be achieved. My product thus differs from the prior products in which flakelike particles of metal incorporated in a binder present a surface which reflects a beam of light at a single dihedral angle or incident. The comminuted material which I use, however, is preferably "alive" and sparkles.

Not only grinding wheels, but abrasives of all descriptions may be represented by my process, and such things as brick buildings very effectively portrayed. It would be impossible for me to give even a small fractional part of the possible articles and things which can be effectively portrayed by my invention. The process may be varied for different mixtures of ink and different grades of paper not only by adjusting the burners but also by controlling the speed of the

driving motor such as by the use of the rheostat **48** and controller handle **49** shown in the patent to Smith referred to.

I find that the product is much improved by cooling the sheets fairly rapidly as they come out of the hot box. Furthermore this allows the sheets to be stacked without having them stick together. Therefore, I prefer to use an electric fan, preferably located above the apron and directing a blast of relatively cool air onto the sheets to cool them quickly to a temperature that permits of handling them and avoids the possibility of their sticking together.

Without limiting the generality of the foregoing, I note that while I have described the process and the article in connection with paper, I may in certain cases use cloth or other backing. Furthermore, although the principal use now contemplated for the invention is that of the illustration or picturization of something, I contemplate that the article and the process may have other uses and no limitation should be implied to the invention other than those expressed in the following claims.

It will thus be seen that there has been provided by this invention a method and article in which the various objects hereinabove set forth, together with many thoroughly practical advantages are successfully achieved. As various possible embodiments might be made of the mechanical features of the above invention and as the art herein described might be varied in various parts, all without departing from the scope of the invention, it is to be understood that all matter hereinbefore set forth or shown in the accompanying drawing is to be interpreted as illustrative and not in a limiting sense.

I claim:—

1. The combination with a sheet of paper, an ink imprint thereon, and a binder on said ink imprint, of crystalline grain of sufficient grit size that individual particles are visible to the naked eye, embedded in said binder, the binder covering the grain so that it is not exposed.

2. The combination with a sheet of paper and an ink imprint thereon, of a binder of rosin on said ink imprint and crystalline grain of sufficient grit size that individual particles are visible to the naked eye, in said rosin, the rosin covering the grain so that it is not exposed.

3. The combination with a sheet of paper, and a resinous thermographic ink imprint thereon, of a rosin binder on said ink imprint, and crystalline grain of sufficient grit size that individual particles are visible to the naked eye, in said binder, the binder covering the grain so that it is not exposed.

4. The combination with a sheet of paper, and an ink imprint thereon, of a transparent binder united to said ink and crystalline grain of sufficient grit size that individual particles are visible to the naked eye, in said binder, the binder covering the grain so that it is not exposed.

5. The combination with a sheet of paper, an ink imprint thereon, and a binder on said ink imprint, of grains of alumina in said binder, the binder covering the grain so that it is not exposed.

6. The combination with a sheet of paper, an ink imprint thereon, and a binder on said ink imprint, of grains of crystalline grain of sufficient grit size that individual particles are visible to the naked eye, in said binder, the binder covering the grain so that it is not exposed.

7. The combination with a sheet of paper, of a first printing forming a pattern, design or picture, a second solid color printing over said first printing, a translucent binder adhering to said second printing, and crystalline grain of sufficient grit size that individual particles are visible to the naked eye, in said binder, the binder covering the grain so that it is not exposed.

8. The combination with a flexible fabric, of a coating secured thereto comprising crystalline grain of sufficient grit size that individual particles are visible to the naked eye, embedded in rosin, the rosin covering the grain so that it is not exposed.

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