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FACSIMILE RECEPTION MEDIUM

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My invention relates to a coating which may be converted by means of heat so as to produce areas of different reflectivity, thus providing images or characters on said coating. More particularly, my invention relates to a novel facsimile paper comprising a transparent coating superimposed on to a conductive backing whereby upon electrical impulses being transmitted from a stylus through the coating to a conductive backing, the heat generated by the electrical impulse causes bubble formation in the transparent coating with subsequent destruction of the bubble causing areas of refraction and reflectivity whose markedly changed appearance from the remainder of the transparent coating may be employed as print or pictures.

Although my invention is of general application, I am particularly concerned with the production of a paper on which may be reproduced print or pictures in accordance with impulses from a stylus moving across said paper. For the general operation of facsimile devices for transmission and reception of images, I refer to Finch Patents No. 2,141,975 and No. Re. 19,575.

It has been difficult to provide a paper for receiving the images which is both properly sensitive and of acceptable appearance at a reasonable cost.

I now provide a novel paper for the reception of facsimile images. My paper comprises an electro-conductive backing on which is coated a transparent layer of material which is adapted to be physically changed by the heat induced by an electric current which traverses the coating. The physical change which I refer to involves the formation of surfaces of different reflectivity or refraction than the remainder of the transparent coating and these areas of different reflectivity and refraction, therefore, may be employed to obtain images or print. As an analogy these areas represent a cracked ice effect such as a skate mark, or an etched or ground glass effect, as against transparent ice or clear glass.

Specifically I employ as the conductive backing for my composite facsimile paper a paper impregnated with carbon. Such a carbon impregnated paper is a good conductor. I then coat this carbon paper by brushing, dipping, spraying or the like, with a layer of a water solution of sodium silicate. I then dry this coating and the sodium silicate forms a clear glass like coating on the carbon impregnated paper.

The sodium silicate retains a certain amount of water. When this paper is used for facsimile reception a stylus as shown in Patent No. Re. 19,575

19,575 moves back and forth across the surface of the paper in slight pressure contact therewith and at particular points, in accordance with the image being broadcast, electrical impulses at a voltage of up to 300 volts are transmitted by the stylus through the coating to the conductive backing. However with my more sensitive paper, higher voltages and lower currents may be employed. These electrical impulses generate heat in the particular areas which they contact and the heat causes the water in the sodium silicate coating to expand to form water vapor and possible steam. This expansion causes the formation of bubbles and the bubbles customarily burst under this expanding force and then freeze in place as they are formed.

I wish to point out that the pressure action of the stylus in passing over these bubbles crushes them and tends to cause them to burst so that the areas of varied refraction and reflectivity similar to cracked ice are more readily formed.

Although it is possible to prevent the bubbles from bursting by the use of a lower temperature and by preventing a pressure contact of the stylus with the paper in which event iridescent bubbles are formed, which may for certain purposes be desired, I normally desire to form burst bubbles, the effect of which produces an improved print appearance.

The sodium silicate is fire proof and does not support combustion. Therefore, the heat induced by electrical impulses does not burn the sodium silicate but simply physically changes it by the formation of the bubbles above referred to.

Since the paper backing which I normally employ as the base for my facsimile paper is rather flexible, I prefer to add a small quantity of glycerin or suitable plasticizing agent to the sodium silicate since without the addition of this glycerin or its equivalent the sodium silicate has a tendency to make the paper stiff and cause it to roll up or curl on contact with the moisture of the air. The glycerin further acts to hold the water in the silicate which is a hygroscopic agent in itself. The glycerin, therefore, prevents the paper from curling and the sodium silicate from becoming stiff and, in addition, it retards the evaporation of the water therefrom.

The amount of glycerin is limited by the fact that an excess of glycerin acts to interfere with the proper passage of the current therethrough and hence reduces the amount of heat. Since it is necessary to develop the heat in the coating to vaporize the water and cause the formation

of bubbles to obtain the white cracked ice appearance, an excess of glycerin is undesirable.

I have found that about a drop of glycerin to about 4 cc. of sodium silicate representing about $\frac{1}{2}$ to 1% of glycerin with respect to the sodium silicate is approximately the amount required.

I prefer to employ a thin coating of sodium silicate with or without the plasticizing agent on the carbon paper. Since the carbon paper is black and the water bubbles, upon bursting, form a white cracked ice appearance, I obtain a white print on a black background which is aesthetically desirable in this art.

Although I have described my paper as comprising conductive backing coated thereon with a substance adapted to bubble or crack under the influence of an electric current, the broader aspect of my invention covers the paper that would not necessarily have a conductive backing. In such event the break down of the coating could be effected by heat alone in the form of radiant heat focussed progressively on to particular areas, the focussing effecting a heating of the coating at the particular points which would cause the bubbling or cracking effect for the desired change in appearance of particular areas to form words or pictures thereby.

In addition to using a focussed radiant heat, I may also employ a blast of hot air. Thus in this aspect of my invention, I may employ any base desired together with a coating thereon, the coating being adapted to be physically changed by heat produced, for example, by radiant heat or conducted heat to particular areas thereof to produce a physical change and hence the changed appearance of relative areas to produce the desired effect. The coatings in this case may be as described above, for example, of sodium silicate or similar material, the appearance of which may be radically altered by heat.

As a means by which this could be carried out in a facsimile receiving apparatus I propose to use a strong radiant heat source which may be focussed on to a small area of the coating, thereby heating that area and turning on and off or deflecting this heat effect in accordance with the markings desired.

Similarly I could employ a stylus with a point which could be rapidly heated while in contact with the coating to again produce the desired physical change in the coating by the heat effect.

The object of my invention is to provide a novel coating which may be physically changed by heat in particular areas in order to reproduce desired images or characters.

It is another object of my invention to provide a novel transparent coating, particular areas of which may be heated to cause the formation at those particular areas of bubbles or burst bubbles giving a cracked ice appearance which is opaque.

It is a further object of my invention to provide a novel coating for facsimile paper in which the characters are produced by causing formation of burst bubbles or cracked ice appearance in particular areas.

It is a further object to provide a novel facsimile paper comprising a conductive backing, and a transparent coating.

It is a further object of my invention, therefore, to provide a coating material which may be so affected by heat applied to specific areas thereof so as to change the physical appearance of those specific areas for the purpose of reproducing images of printing or pictures, etc., thereon.

It is a further object of my invention to provide a process for facsimile reception in which I project radiant heat progressively on to specific areas to change the physical appearance of these areas to produce facsimile images.

Specifically my invention is directed to the provision of a paper which comprises a backing material, if such backing be necessary, and positioned thereon a coating of a material such as sodium silicate which is adapted to be acted upon by heat to produce areas of different reflectivity and appearance. The sodium silicate coating may be affected by heat in particular areas induced by a stylus carrying an electric current. The heat may also be induced as indicated by a beam of radiant light or heat which is directed onto different areas of the paper.

Although I specifically refer here to the use of a coating of sodium silicate which may contain water and glycerin, it is to be understood that this is by way of example only and that any coating having these physical properties may be employed, namely any coating, the appearance of which may be radically changed in specified areas so as to produce physically distinct areas. By physical change here, I mean changes in contradistinction to the changes which may be induced by oxidation or other chemical change to produce different colors.

My invention further comprises preheating the paper and the coating thereon immediately before the application thereto of the heat for effecting the color change. I have found that if the heat sensitive material is preheated to almost the point where it will change color, just before the heat from the signal transmitted by the stylus is applied, faster recording can be had or large recordings may be made in the same time.

Further by means of this preheating of the coating to almost the point of color change I may employ a weaker radiant heat, or a weaker current, when current is employed for effecting the heating, to effect the recording.

For example, the platen in back of the paper may be heated along the line where the recording is just thereafter to be produced and specifically it may be heated in an area of two lines width, including the line which is being converted and the width of one line therebelow, the heat being begun just before and continuing until the line is recorded. I have found that this preheating of the heat sensitive paper acts as an accelerator of the color change in the paper when it is subjected to the heat from the stylus or the radiant heat from a suitable radiant heat source, and I can, as pointed out, obtain faster recordings and better recordings even while using lower heat impulses as the color change producing means.

When I employ a radiant heat source in lieu of the stylus which contacts the recording paper I may obtain enlargements or large reproductions of the printing or picture to be reproduced. This is because the beam of radiant heat can be far longer than a stylus arm. Instead of being, for example, $\frac{1}{100}$ of an inch wide and four inches long, which may be the dimension of the stylus, the beam of radiant heat may be $\frac{1}{6}$ of an inch wide and 40 inches long.

By means of the preheating of the recording paper which I have described above, the recording paper which I have described above, the recording paper is rendered very sensitive and the amount of heat transmitted over this long radiant beam is sufficient to induce the desired color

changes in the specified areas. Thus, for example, for educational purposes a class might view a recording at a distance of a number of feet.

In lieu of using the longer radiant beam for enlargements as pointed out above, I may employ it to obtain more columns of copy. This is because, although a stylus which is limited by its length to producing in arcuate movement approximately two columns of recording, the beam of radiant heat is capable of producing many more columns because of its greater distance of travel.

Thus it can be seen that the novel recording means and the novel recording paper is capable of many variations within the scope of my invention. I do not intend to be limited to the particular heat sensitive paper and coatings which I have set forth but have given these by way of example only.

Further, I have exemplified as my means for producing the physical change in the recording paper, heat in the form of contact heat, conducted heat and radiant heat. The radiant heat may be induced in any manner, as for example, from a light source or from a reflecting source or infra-red means, and other heating sources may also be employed.

I have given these various means for heating by way of example for inducing the physical changes in the recording paper and intend to include all mechanical equivalents within the scope of my invention.

I claim:

1. A reproduction paper comprising a backing and a heat sensitive coating, which under the influence of heat forms bubbles, positioned thereon.

2. A reproduction paper comprising a backing and a coating of sodium silicate containing water positioned thereon.

3. A reproduction paper comprising an electro-conductive backing and a coating of sodium silicate containing water positioned thereon.

4. A reproduction paper comprising carbon impregnated paper and sodium silicate containing water positioned thereon.

5. A reproduction paper comprising a carbon impregnated paper and sodium silicate containing water containing a small amount of glycerine positioned thereon.

6. A reproduction paper comprising a carbon impregnated paper and sodium silicate containing water containing about one-half to one per cent of glycerine positioned thereon.

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