

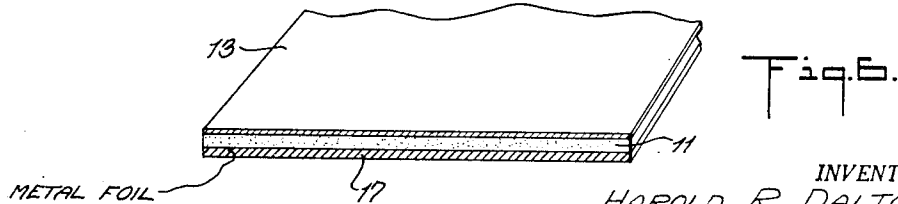
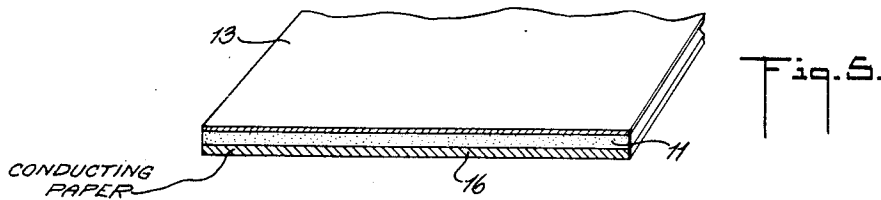
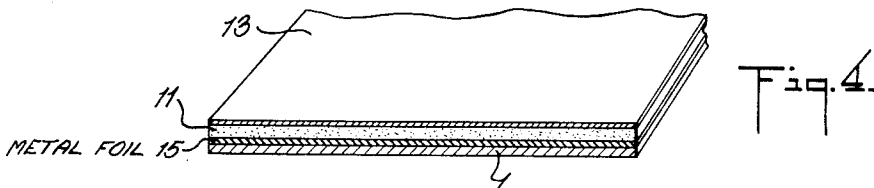
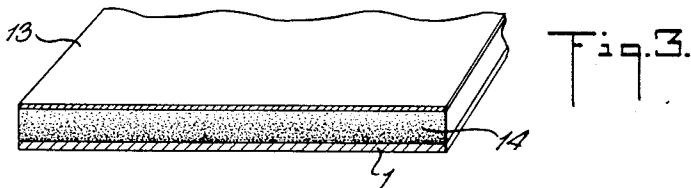
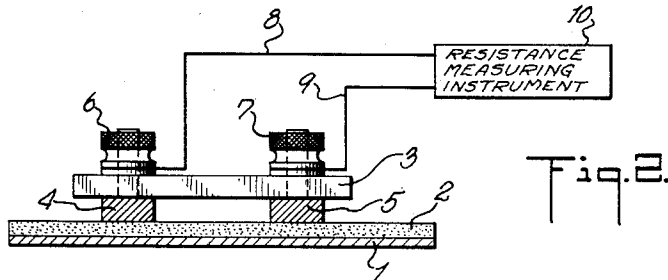
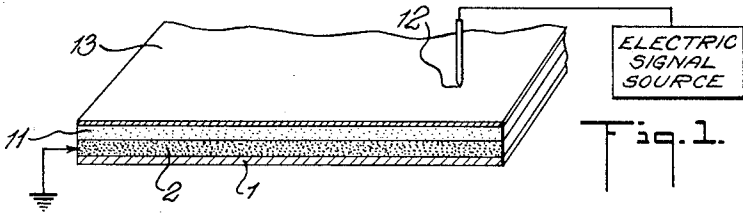
Dec. 29, 1953

H. R. DALTON

2,664,044

ELECTRIC SIGNAL RECORDING BLANK

Filed Jan. 16, 1948



INVENTOR.
HAROLD R. DALTON

BY

John J. Logan
ATTORNEY

UNITED STATES PATENT OFFICE

2,664,044

ELECTRIC SIGNAL RECORDING BLANK

Harold R. Dalton, Jenkintown, Pa., assignor to
Timefax Corporation, New York, N. Y., a cor-
poration of New York

Application January 16, 1948, Serial No. 2,563

9 Claims. (Cl. 101—149.4)

1

This invention relates to recording blanks and more particularly to blanks for recording electric signals such as facsimile signals and the like.

A principal object of the invention is to provide an improved recording blank which is responsive to stylus applied electric signals, whereby clearer and sharper recordings can be obtained.

Another object is to provide a recording blank having an underlayer containing a transferable dye, and a contrasting or masking outer layer which is removable in localized areas to expose the underlayer, in conjunction with an intervening layer of predetermined electric conductivity which also acts to prevent bleeding of the dye into the masking layer.

A further object is to provide a recording blank which is responsive to stylus applied electric currents, and consisting of a backing or support having an outer masking coating which is removable in localized areas by said signal currents, in conjunction with an intervening coating of graded electric conductivity considered transversely between the masking coating and the backing support.

A feature of the invention relates to a facsimile recording blank, comprising a backing of paper, cardboard or the like, having a series of coatings consisting respectively of a first coating of relatively low electrical resistance, a second coating of high electrical resistance, and a third or masking coating which is adapted to be removed in localized areas by stylus applied electric signals.

Another feature relates to a facsimile recording blank, comprising a backing support having an outer masking coating of contrasting color which is adapted to be removed in localized areas, and an intervening conductive coating consisting of a layer of carbon bearing material of graded electric conductivity between the backing and the masking coating.

A further feature relates to a recording blank, comprising a paper-like backing having a metallized surface in contact therewith and a layer of carbon-bearing material applied to the metallized surface so that said layer has a much higher electrical resistance than the metallized layer, and an outer masking coating of contrasting color with respect to the carbon-bearing coating.

A further feature relates to a recording and duplicating blank, comprising a backing of paper or the like having applied thereto a first stratum of carbon-bearing material of predetermined electric conductivity and containing a transferable dye, an additional carbon-bearing stratum of higher electrical resistance applied over the first

2

stratum, and an outer contrasting masking coating over the second carbon-bearing coating, the second carbon-bearing coating being of predetermined electric conductivity to concentrate the recording action of the stylus to a region immediately under the stylus point and also serving to prevent bleeding of the dye into the masking coating.

A still further feature relates to the novel organization, arrangement and selection of parts which cooperate to provide an improved facsimile recording blank of the dry type.

In the drawing,

Fig. 1 is an enlarged cross-sectional view of a preferred form of recording blank according to the invention.

Fig. 2 is a schematic cross-sectional view explanatory of the method of determining the electrical resistance of certain of the coatings of Fig. 1.

Figs. 3, 4, 5 and 6 respectively are modifications of the blank of Fig. 1.

Heretofore, facsimile recording blanks have been divisible into two general kinds, the so-called wet blank which requires a definite water or other liquid content; and the dry or direct recording blank. One form of dry blank which has gone into considerable use, comprises a black conducting paper coated with a white or contrasting masking coating. Another form of the dry blank which has gone into considerable use, comprises a sheet of ordinary white paper, such as bond or book paper, which is substantially non-conductive, and has superposed thereon a black or dark colored coating of substantial electric conductivity, and over this conductive coating is applied a white or contrasting masking coating. In both forms of dry blank, the recording is effected by means of a sharp pointed stylus upon which signal potentials are impressed. These potentials act on the masking coating in localized areas to expose the dark or black conductive coating. The present invention is concerned with improvements in both the above-noted forms of dry recording blanks. One of the important improvements that has been achieved in the above-noted dry recording blanks is the incorporation of a dye material into the conductive carbon coating to permit the blank to be used as a duplicating blank after the intelligence has been recorded thereon by facsimile. For a detailed description of such a blank, reference may be had to abandoned application Serial No. 435,944, filed March 24, 1942, or the division thereof which resulted in U. S. Patent No. 2,638,422. While these duplicating facsimile re-

cording blanks are entirely suitable for their purpose, it very frequently happens that the dye in the carbon conductive coating has a tendency to bleed into the masking coating. While this does not affect substantially the recording properties of the blank, it does produce a background color on the copy which is objectionable. The present invention provides a blank which is substantially free from this bleeding effect.

In accordance with the present invention, the coating between the paper backing and the outer or masking coating, instead of being formed of a single homogeneous layer of conductive material, is formed of a layer or layers having graded electrical conductivity considered transversely through the thickness of the blank. This graded conductivity can be achieved by using two or more strata of carbon-bearing material, each of which is of different electric conductivity, or by using a single layer of such material whose conductivity varies transversely and progressively through its thickness. For purposes of explanation, this graded layer will be referred to as the graded coating. Preferably, the graded coating is applied in the form of two films each containing a different type of conducting carbon, or carbon blacks, of markedly different electrical resistance.

I have found that the best results are obtained if the portion or stratum of the graded coating adjacent the paper backing, is of a much higher electrical conductivity than the stratum of the graded coating adjacent the masking coating. By this arrangement, when the blank is attached to a grounded metal scanning drum or grounded metal strip, the recording current which passes through the blank from the stylus is carried to the grounded drum or strip with as little loss of energy as is possible. Conversely, the stratum adjacent the masking coating, being of much higher resistance, dissipates the greater part of the recording electric energy directly under the stylus point. This results in clearer and sharper recordings. At the same time, the provision of the second film of conducting carbon prevents or at least substantially reduces the tendency of any dye which is contained in the coating adjacent the paper from bleeding into the masking coating.

Referring to Fig. 1, there is shown one preferred form of recording blank according to the invention, comprising a paper backing 1, which may be of any common paper. As a typical example, the backing 1 may be a white English-finish sulfite paper suitably sized for coating and weighing approximately 55 pounds per 500 sheets (25 inches by 28 inches). Applied in any well-known manner to sheet 1, is a first conductive coating or film 2, which may consist of conductive carbon black in a suitable binder. Preferably, coating 2 is prepared according to the following formula wherein the proportions are represented in terms of weight:

10.0 copolymer of vinylidene chloride and acrylonitrile a 20% solution in methyl ethyl ketone at 25° C. having a viscosity of approximately 200 cps.
60.0 methyl ethyl ketone.
4.0 carbon black (acetylene).

The above ingredients are mixed together and ball-milled for approximately ten hours or until the carbon black is thoroughly dispersed throughout the mixture and the resultant mixture is then applied to the paper 1 by spraying, brushing,

knifing or any other well-known manner, to a wet thickness of approximately 0.001 inch, after which the paper and coating are dried by evaporating the solvent. The resistance of the coating 2 thus prepared, depends somewhat upon the thickness of its application and is in the range of 500 to 5000 ohms per unit area. This resistance can be measured in the manner indicated in Fig. 2, by means of a Bakelite support 3, carrying a pair of square surfaced metal electrodes 4, 5, each electrode having a square surface contact with the coating 2 of 1 sq. cm. and the electrodes 4 and 5 being spaced 1 cm. apart. The electrodes 4 and 5 are held in contact with the coating 2 by means of a weight of 1 kg. (not shown) resting on the Bakelite support 3. The electrodes 4 and 5 have respective screw terminals 6, 7, which can be connected by wires 8, 9, to a Wheatstone bridge 10 or other well-known resistance measuring device.

Applied to the coating 2 is another conductive coating 11 containing conductive carbon in a suitable binder but having a higher electrical resistance than the coating 2. Thus the coatings 2 and 11 form a graded conductive layer of graduated specific resistance from front to back of the blank. Preferably, this coating 11 is prepared in accordance with the following formula wherein the proportions are represented in terms of weight:

10.0 polyvinyl butyral having a molecular weight of approximately 10,000.
120.0 ethyl alcohol.
3.0 carbon black (channel black of good electrical conductivity).
3.0 dioctyl phthalate.

The above ingredients are mixed together and ball-milled for at least 10 hours or until the carbon black is thoroughly dispersed throughout the mixture, and the coating 11 is applied with a wet thickness of approximately 0.004 inch, whereupon the coating is dried by evaporating the solvent. When the coating 11 is applied as above and its resistance measured as described in connection with Fig. 2, the combined resistance of the coatings 2 and 11 is in the range of approximately 1000 to 8000 ohms. Coating 11 by itself has a very low electrical conductivity; in fact, if it were applied directly to the uncoated paper 1, and then measured as described in connection with Fig. 2, it would show a resistance of over 500,000 ohms. However, when coating 11 is superposed on coating 2, the combined resistance is lowered.

The blank is completed by applying to the coating 11 a masking coating 13 which may be white or other light colored material which contrasts in color with the coating 11, so that the masking coating 13 is removed in localized areas in response to the electric signals applied to stylus 12, it correspondingly exposes the black coating 11. The masking coating 13 should be prepared so that it has little tendency to bleed into the coatings 2 and 11. One masking coating that has been found satisfactory with the conducting coatings 2 and 11 is prepared according to the following formula where the proportions are in weights:

6.0 ethyl methacrylate polymer a 20% solution in toluene at 25° C. having a viscosity of approximately 1000 cps.
200.0 toluene.
30.0 zinc sulfide.
2.0 dioctyl phthalate.

The above ingredients are placed in a ball-milled or colloid mill and milled until the zinc sulfide is thoroughly dispersed. The coating 13 is applied with a wet thickness of approximately 0.0005 inch and dried by evaporation of the solvent.

Since the coating 11 is of high resistance and is closer to the stylus than the coating 2, the electrical energy from the stylus 12 will be dissipated for the most part directly at its point, thus removing a minute amount of the masking coating 13 to produce a clear and sharp record of the signal. It has also been found that the blank as described when subjected to the stylus currents exhibits less smoke and smudging as compared with the known dry-recording blanks.

It is also important that the two coatings 2 and 11 be prepared so as to be free from intermingling. This may be accomplished by selecting a solvent for the coating 11 which does not have any effect upon the coating 2. If desired, the intermingling may be avoided by rapidly drying the coating 11 after it is applied to the coating 2. The invention is not limited to a graded coating consisting of only two layers. Any number of layers of different resistance materials may be employed providing the layer adjacent the stylus 12 is of much higher resistance than the remote layers. In fact, a single layer may be employed providing its transverse electrical conductivity is of progressively variable magnitude. Such a blank is illustrated in Fig. 3 and consists of a paper backing 1 which may be similar to the backing 1 of Fig. 1, and applied to the paper 1 is a layer 14 of conductive carbon in a suitable dried binder, the carbon having been deposited in such a way that the electrical resistance adjacent the paper 1 is much lower than the electrical resistance adjacent the masking coating 13 which masking coating may be the same as coating 13 of Fig. 1. If desired the paper 1 can contain an electrically conductive filler.

It is not necessary that the first coating 2 be of a carbon content (Fig. 1). Thus, as shown in Fig. 4, the paper may have applied thereto in any suitable manner a metallic foil or film 15 to which is then applied the conductive carbon coating 11 and over which is applied the masking coating 12. The film 15 may take the form of aluminum film, lead or any other conductive material such as is commonly used in forming metallized papers.

If desired, the paper 1 and coating 2 can be combined by incorporating into the paper 1 a suitable conductive filler such as carbon. Such a blank is shown in Fig. 5, wherein the paper 16 may have incorporated therein sufficient carbon to render it a good conductor, for example corresponding to the conductivity of the coating 2 described in connection with Fig. 1. Applied to the conductive paper 16 is the carbon content coating 11 above described having a higher resistance than the paper 16, and over which is applied the masking coating 13.

A further modification is illustrated in Fig. 6, wherein the backing member consists of a sheet 17 of metal foil to which is applied the high resistance carbon content coating 11 and over which is applied the masking coating 13.

As pointed out above, one of the advantages of using the graded or multiple layer conductive coating between the backing and the outer coating 13, is that a transferable dye such as methyl violet or the like can be incorporated in the lower resistance conductive film, and the higher resistance film which is superposed thereon acts to prevent bleeding of this dye into the coating

13. Thus, a suitable transferable dye may be incorporated in the coating 2 of Fig. 1 or the coating 14 of Figs. 3 and 4 respectively. The invention is of course not limited to any particular color dye, and if desired a dye mixture may be incorporated in the coatings 2, 14 or 15, to provide a black transfer when the coating 13 is removed in response to the electric signals applied to the stylus 12. For a detailed description of typical dyes and the method of incorporating them in the coatings 2, 14, reference may be had to abandoned application Serial No. 435,944, filed March 24, 1942, or the division thereof which resulted in U. S. Patent No. 2,638,422. The addition of the dye to the said coatings does not materially increase the resistance thereof, so that the above-mentioned differential in resistance between the several strata of the graded coating is preserved.

While certain embodiments have been disclosed herein, it will be understood that various changes and modifications may be made therein without departing from the spirit and scope of the invention.

What is claimed is:

1. An electro-sensitive recording blank comprising a paper base having a top coating which is of light color compared with the surface of the blank beneath said top coating, an electrically conductive coating on said base and containing a transferable dye, another electrically conductive coating on said first conductive coating and having a higher electrical resistance than said first conductive coating.

2. A recording blank according to claim 1 in which each of said conductive coatings contains powdered conductive carbon to impart a black color thereto, and said outer coating contains a whitish pigment.

3. A recording blank according to claim 1 in which said top coating is substantially non-conductive.

4. An electro-sensitive blank for recording electric signals applied thereto, comprising a supporting backing of non-conducting material having an outer coating which is removable in localized areas in response to electric signals applied thereto, and an intermediate coating of electrically conductive material sandwiched between the backing and said outer coating, said material being of graded conductivity through its thickness considered from the outer coating to the backing and with the portion thereof of lower conductivity being adjacent to said outer coating and with the portion of higher conductivity having a transferable dye therein.

5. An electro-sensitive blank for recording electric signals applied thereto comprising a supporting backing having an outer coating which is removable in localized areas in response to electric signals applied thereto, and electrically conductive material sandwiched between the backing and said outer coating, said conductive material having a low resistance stratum adjacent the backing and a high resistance stratum adjacent said outer coating, said low resistance stratum also including a transferable dye.

6. An electro-sensitive blank for recording electric signals applied thereto, comprising a supporting backing of non-conductive material having an outer coating which is removable in localized areas in response to stylus-applied electric potentials, and at least two distinct electrically conductive coatings sandwiched be-

7

tween said backing and said outer coating, said conductive coatings having respectively different resistance characteristics, the conductive coating adjacent the backing containing a transferable dye and being of lower resistance than the other conductive coating.

7. A blank according to claim 6 in which the said conductive coating adjacent the backing has a wet thickness of approximately 0.001 inch and the other conductive coating has a wet thickness of approximately 0.004 inch, and the said outer coating has a wet thickness of approximately 0.0005 inch.

8. An electro-sensitive recording blank, comprising a paper base having a top coating, which is removable in localized areas in response to applied electric signals to make the record, and electrically conductive material sandwiched between the base and the top coating, said conductive material having a portion of greater resistance adjacent the top coating and a portion of lower resistance adjacent the base which latter portion also contains a transferable dye, said top coating and said conductive material being of contrasting appearance.

9. The method of making an electro-sensitive recording blank for recording stylus-applied electric signals, which comprises applying to a non-conducting backing support an electrically conductive material having successive strata of different predetermined electric conductivities, ap-

8

plying to said material a masking coating of contrasting color which is removable in localized areas in response to stylus-applied electric signals to expose said material thereat, said conductive material being applied in successive stages to the backing, the stratum adjacent the backing having previously incorporated therein a transferable dye, and the stratum of said material adjacent said masking coating having previously incorporated therein conductive carbon for imparting to the said stratum adjacent said masking coating a higher electrical resistance than the stratum adjacent the backing.

HAROLD R. DALTON.

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