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D. A. NEWMAN
MANIFOLDING PAPER

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Fig. 1

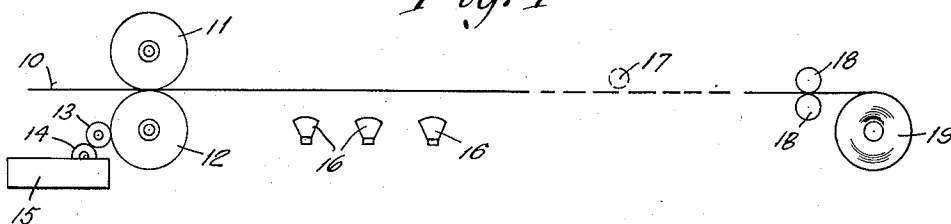


Fig. 2

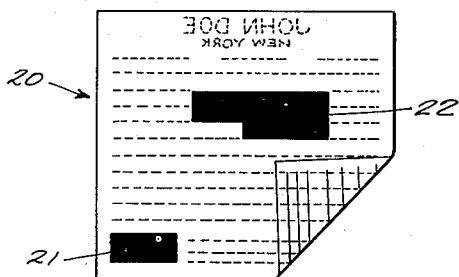


Fig. 3

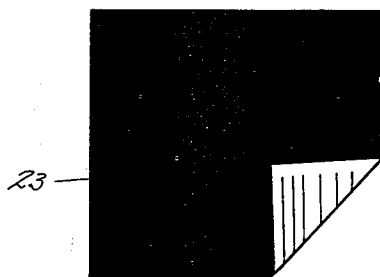


Fig. 4

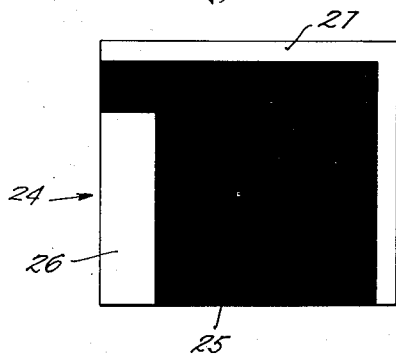
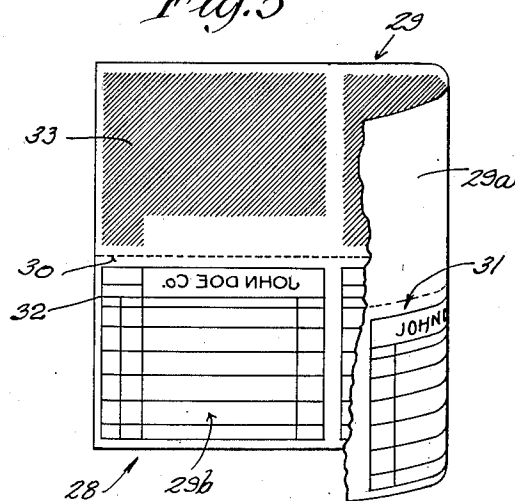


Fig. 5



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MANIFOLDING PAPER

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This invention relates to transfer or duplicating sheets and strips, and to methods of producing the same.

The improvements provided by the invention apply to (1) substantially covered carbon sheets for use in ordinary typewriting, (2) business forms having spot-carbonizing on their backs, (3) continuous transfer strips having spot-carbonizing, in any of which cases the carbon material is usually insoluble in water or alcohol, but sometimes contains dyestuffs which are soluble in such media, and thus may be used in making masters for duplication by either the water or spirit methods, and (4) printed matter such as business forms, in which the printing is to be copyable, and wherein the forms may be filled in with copyable type impressions, in which case the dyestuffs used are soluble in water or spirits.

These improvements result from the concept of the present invention, that the coating of semi-plastic body-providing or transfer base material (usually comprising wax), and consisting of the ingredients of one of the usual wax-carbon formulae less a portion or all of the plasticizing oils, or coloring matter or both so as to be unusable itself as a marking transfer layer, may be applied to the paper separately from activating applications or coatings of either coloring matter or a plasticizing agent, or both and that after the applying of such coatings they may be fused and blended together on the paper by the use of heat. This concept, in one aspect, makes it possible to produce transfer paper by applying coloring matter to the paper in an unheated condition, either at selected spots or over the entire sheet, by printing. Since the wax-containing material of the transfer coating is not applied by the printing plates, there is eliminated the likelihood of these plates becoming gummed-up, in addition to the elimination of the necessity of heating the printing plates.

The concept on which this invention is based also enables a plasticizing agent to be applied as a coating over a non-transferable color-carrying waxy transfer base coating, either at selected spots or over the entire sheet by printing, after which heat may be applied to fuse and blend the several superposed substances. In this case, also, the use of wax composition on the printing plates is avoided.

In the broader aspects of the invention the wax transfer base composition coating, where spot-printed forms are to be produced, may be either colored or uncolored. If uncolored, the transfer base coating need not be of such hardness that it will not transfer under the impact

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of a type blow, since it will not be visible on the copy, but if the coating contains the coloring matter, it should be of a transfer base composition having a hardness such that, at temperatures of use, it will not transfer and if desired the uncolored coating may also be of such hardness.

The terms "hardness" and "hard" as used herein are expressions common in the carbon paper making art. They normally refer to the percentage of waxy material which is the hardening ingredient of the composition, especially the percentages of the harder waxes such as carnauba, montan, candelilla and the like. The degree of "hardness" of the usual transfer coating composition on this basis is proportional to its physical hardness in the usual sense, and is likewise roughly inversely proportional to its transferability. In this same sense "soft" and "softness" relate to the percentage of plasticizing agents used as against the "hardening" or waxy ingredients and "softness" is roughly proportional to transferability as a practical matter.

While for convenience I herein refer to the transfer medium or coating as of wax composition, or if colored, of wax-carbon composition, it should be understood that I intend the latter term to include and embrace compositions not only containing lamp black but also those which contain pigments of any color or colors and/or dyestuff or coloring agents, and that some of these may be soluble in water or spirits so that hectograph duplicates of the copies made with such transfer material may be produced, and that I intend the term wax composition to include and embrace compositions not only containing as hardening or hardenable agents natural waxes but also those which contain other wax or waxy material such as natural or synthetic resin or resins and the like.

Such wax-carbon compositions as the foregoing are commonly known in the art and the types of ingredients and percentages used are familiar to those skilled in making carbon papers. As an example of the general type of wax-carbon transfer compositions now in common use and to which this invention is applicable, reference may be had to "Commercial Waxes," edited by H. Bennett and published in 1944 by Chemical Publishing Co., Inc., Brooklyn, New York, especially the article on pages 373 to 377 by Alan B. Olsen, and formulae appearing on pages 429 to 430.

Other features and advantages will herein-after appear.

In the accompanying drawings:

Figure 1 is a diagrammatic view of a printing press showing the means for applying by printing coloring matter and/or a solvent and plasticizing composition to a coated strip.

Fig. 2 is a view of a coated record sheet showing spot printing on its back surface, the form printing on the face of the form being indicated by dotted lines and on the turned-up corner.

Fig. 3 is a view of a coated record sheet having its entire back surface coated and its front surface printed.

Fig. 4 is a view of a coated transfer sheet which has most of its area covered with transfer material, the remaining area being uncovered and non-reproducing, and

Fig. 5 is a view of a foldable sheet forming part of a continuous coated strip which has a longitudinal fold line, the strip on one side of the fold line showing printing in the shape of a solid block, and on the other side of the line showing printed in mirror reverse, a business form for use in making duplicates by the spirit method.

Referring to Fig. 1, according to one method of practicing the invention, a strip or web of paper 10 which has been previously coated on one side with a transfer base of wax composition, is passed between a backing cylinder 11 and printing cylinder 12 for the purpose of printing on the coating with ink. The process of initially coating the strip 10 is preferably done in a separate hot-process coating machine prior to the introduction of the strip into the printing press shown. Preferably the initial transfer base coating, which may be of a wax composition, is colorless or uncolored, and has its ingredients so proportioned that after the application of the coating and the cooling and setting thereof, it will be "hard," that is, not transferable to another medium in the normal writing pressure range, e. g. under the impact of a type blow, at ordinary temperatures of use.

Plates for the subsequent printing of the strip 10 may be carried on the cylinder 12, and may receive "ink" from inking rollers 13 and 14, fed from an ink fountain 15. After the strip 10 has been printed over the wax-composition coating and leaves the cylinders 11 and 12, according to the present invention, the strip is heated, as by passing over a plurality of heating lamps 16. This causes the wax composition coating on the strip to melt or fuse, and enables the "ink" which has been printed on the coating to mix and blend with the latter. The printing ink contains a plasticizing substance, so that upon being blended with the wax transfer base composition the portions so blended will be softened. Also, a solvent may be contained in the ink, to enable the plasticizing agent and wax composition to blend more readily.

As a result of the blending of the "ink" with the wax coating the latter will be colored at the places where it has been printed on, and therefore when this colored and blended coating is transferred to another medium by pressure the transferred characters will be readily visible.

The composition of the ink and the substance of the initial wax coating is such that after the blending of these and their subsequent cooling, the coating is rendered "soft," that is, readily transferable to another medium under the impact of a type blow at ordinary temperatures.

For the purpose of hastening the cooling of the heated strip 10 the latter may be passed under a cold roller 17, and then passed between feed

rollers 18 and wound into a roll 19 for storage or subsequent use.

According to the improved method of producing transfer paper, as provided by the invention, the printing equipment comprising the plate and cylinder 12, rollers 13, 14 etc., is not subjected to wax or resin-containing substances, and therefore there is avoided the likelihood of the printing plates and inking rollers becoming clogged or gummed. The printing may be done cold, and when the strip 10 is passing between the cylinders 11 and 12 the waxy transfer base composition coating on the strip will not transfer to the rollers to any practical extent.

The above process for producing transfer paper is particularly advantageous where it is desired to manufacture spot-carbonized forms. For instance, as shown in Fig. 2, a printed business form 20 having carbonized transfer spots 21 and 22 may be readily produced by the present method. The form 20 may be made from a continuous strip of paper such as the strip 10. This strip, preferably prior to the printing of the desired form on its face, would have its reverse side substantially completely coated with the hard non-transferable wax composition. The strip may then be passed into the printing press and have the proper form imprinted on its front or face, and also have the spot-carbon portions 21 and 22 imprinted on its reverse side over the wax coating. The producing of the spots 21 and 22 may thus be easily accomplished, since it is merely a matter of providing the proper printing plate with spots or designations to pick up the "ink" and deposit the same on the strip at the desired locations.

The subsequent heating of the strip 10 causes the entire wax-composition coating to fuse, and those portions or areas of the coating which carry the printed ink will be blended with the latter and colored, and also rendered soft and transferable. The subsequent cooling of the strip will restore the unprinted portions of the wax coating to its hard state wherein it is non-transferable, and will render the printed and blended portions of the coating substantially smudge-proof, these latter portions, however, still being transferable under the impact of a type blow, due to the presence of the plasticizer.

When the sheet 20 is placed in use, either in a typewriter or other machine in conjunction with a duplicate copy sheet located against its reverse side, any writing or typing done on the face of the sheet beyond the boundaries of the spot-carbonized areas 21 and 22, will not result in a transfer of impressions to the copy sheet. However, where writing or typing is done over the areas 21 and 22, the colored and blended coating will be transferred to the copy sheet, to duplicate thereon the original inscriptions. Forms such as the sheet 20 are often used where it is desired to have certain writing or copy appear on the copy sheet, and other writing such as price extensions and the like, not appear.

The printing ink applied by the cylinder 12 may contain carbon or other color or pigments or it may contain dyestuffs either insoluble or soluble in water or alcohol. If the ink contains dyestuffs which are soluble in water and alcohol, copies made from the form 20 may be used for duplication by the water or spirit methods.

If desired, business forms may be produced according to the method of this invention, on which the entire back surface is colored and transferable. Such a form 23 is shown in Fig. 3,

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and involves the procedure of printing over the entire coating of the strip 10, instead of only in spots. The use of printing plates to determine the areas which are to be transferable on a business form, enables areas of any desired size or configuration being produced. For instance, as shown in Fig. 4, a sheet 24 has a printed transfer area 25 over most of its back surface except for marginal portions 26 and 27 as indicated.

The producing of folded master forms, as for use in the water or spirit methods of duplication may be readily and advantageously carried out according to this invention. As shown in Fig. 5, such a form 28 is illustrated, comprising part of a continuous strip or web 29 having a longitudinal perforation and fold line 30, substantially midway between its edges. The web 29 may be coated over its entire back surface in the same manner as the strip 10 and then fed into the printing press to accomplish the printing and spot carbonizing. The front face 29a of the strip, along one side of the fold line 30, is printed with the desired business forms 31 as indicated. The wax-coated back of the strip is printed, as indicated, with form 32 which are the mirror-reverse of the forms 31 and are in registration with the latter forms.

Along the other side of the fold line 30 the back of the strip 29 may be printed in the shape of a solid block 33, and this printing may advantageously be done simultaneously with the printing of the reverse forms 32.

The printing of the forms 32 and 33 may be accomplished with a single plate, or with individual plates mounted to rotate in unison about a single shaft, and the ink used in this printing should contain coloring matter such as dyestuffs and the like which is soluble in water or alcohol.

After the printing of the forms 32 and 33 on the coating of the strip, the latter is heated, whereupon the ink of the printed areas is caused to fuse and blend with the wax coating of the strip. As a result, upon cooling and hardening again, the portions of the coating which have received the printing 32 and 33 will be colored and transferable, and the remaining portions of the coating will return to a hard condition which prevents its transference under writing pressures.

The strips 29 may be passed over cooling rollers to hasten the cooling and setting of the coating and printing, after which the transferable part of the coating is substantially smudge-proof. The strip 29 may then be wound in a large roll for storage or subsequent use, or may be cut up immediately into form lengths as desired.

In use, the form 28 is folded along the line 30 so that the coated surfaces are adjacent each other. When the face of the form, which has the printing 31, is written or typed on, the impressions may or may not be transferred to the back of the form which has the printing 32, according to whether or not the original impression was made in an area included by the block printing 33.

The transferred impressions will appear in reverse on the surface 29b of the form 28, in the proper spaces and columns of the form 32, and when the desired writing or typing has been completed, the form 28 may be separated along the fold line 30 and the portion containing the printing 31 and 32 and the transferred reverse characters may then be used as a master for duplication by the water or spirit methods. The form 32 as well as the written transferred characters will thus be reproduceable on the copies being made.

Considering the form 20 shown in Fig. 2, for

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instance, the wax-composition coating which is applied to the sheet before the spot-printing or carbonizing is done need not be "hard," that is, of such characteristics that it will not transfer under imprinting pressures, since it is substantially clear or colorless. If it is of a soft composition, the transfer of the coating from areas outside of the carbonized blocks 21 and 22, in which outside areas it is not desired to transfer impressions, will not be readily visible or discernible on the copy sheet for all practical purposes. Even when such transfer of clear wax-containing matter does take place, the form may still be used as a master for duplication by the water or spirit methods, since the transferred clear wax substance will not contain water or alcohol soluble dyestuffs which would show up in copies.

Or, considering again the form 20 shown in Fig. 2 the initial wax coating given to the paper need not be uncolored, but may have coloring matter such as pigments and the like, provided the coating is of sufficient hardness that it will not transfer under writing pressures and at ordinary temperatures.

These same considerations as to the initial coating of wax composition, also apply equally to the forms 24 and 28 shown in Figs. 4 and 5 respectively.

Although the method of the invention as explained in connection with the forms shown in Figs. 2 through 5 has been described as using a colored printing substance or ink, which is superposed on the wax-composition coating, it is not necessary that the printing substance be colored. For example, the wax-composition coating may be colored, either with dyestuffs, pigments, carbon, etc., and this coating may be of such hardness at normal temperatures of use that it will not transfer under writing pressures. Then, softening of the wax coating may be accomplished in a printing press using an uncolored solvent and plasticizing agent. In such cases, when the coated and "printed" strip is heated, the wax coating will fuse and will blend with the solvent and plasticizing substances so that, upon subsequent cooling and setting of all substances, the portions of the coating which have not been "printed" on will return to a hard condition and be non-transferable, whereas the remaining portions of the coating which have been "printed" on will be soft and transfer under imprinting pressures.

The strip or sheet such as the sheet 20 shown in Fig. 2, for instance, need not have printed matter on its obverse face, for it can serve merely as a carbon or transfer sheet to be interposed between two other record sheets or strips.

In any case, the producing of the various transfer sheets and strips according to the invention will have been accomplished by a process of printing over a prepared wax or resin coated sheet or strip, and by this process the use of wax or other gummy or resinous matter in connection with printing plates is avoided, and therefore the latter are not likely to become gummed up and the need for heating the printing plates is obviated.

Variations and modifications may be made within the scope of this invention and portions of the improvements may be used without others.

I claim:

1. A manifolding record member having predetermined duplicating areas, comprising a flexible foundation sheet having a waxy coating on one surface extending to at least two opposite edges thereof, said coating as applied being of

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such hardness at temperatures of use as to be non-transferrable to another medium by normal writing pressure applied to the sheet, portions of the said coating having a plasticizing agent applied thereto and commingled therewith to produce in said portions sufficiently softer characteristics to be transferrable to another medium by normal writing pressures applied to the sheet.

2. A manifolding record member having predetermined duplicating areas, comprising a flexible foundation sheet having a waxy coating on one surface extending to at least two opposite edges thereof, said coating as applied being of such hardness at temperatures of use as to be non-transferrable to another medium by normal writing pressure applied to the sheet, portions of the said coating having a mixture of a plasticizing agent and coloring matter applied thereto and commingled therewith to produce in said portions sufficiently softer characteristics to be transferrable to another medium by normal writing pressures and sufficiently colored to form a clearly readable mark against a contrastingly colored background.

3. A manifolding record member having predetermined duplicating areas, comprising a flexible foundation sheet having a waxy coating on one surface extending to at least two opposite edges thereof, said coating as applied including coloring matter sufficient to form a clearly readable mark against a contrasting background and being of such hardness at temperatures of use as to be non-transferrable to another medium by normal writing pressure applied to the sheet, portions of the said coating having a plasticizing agent applied thereto and commingled therewith to produce in said portions sufficiently softer

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characteristics to be transferrable to another medium by normal writing pressures applied to the sheet.

4. A manifolding record member as set forth in claim 2 in which the coloring matter has hectograph duplicating properties capable of forming a hectograph master when transferred to another sheet.

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