

Aug. 20, 1957

W. J. STOLLE ET AL

2,803,579

METHOD OF MAKING AN IMPRESSION MEDIUM

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2 Sheets-Sheet 1

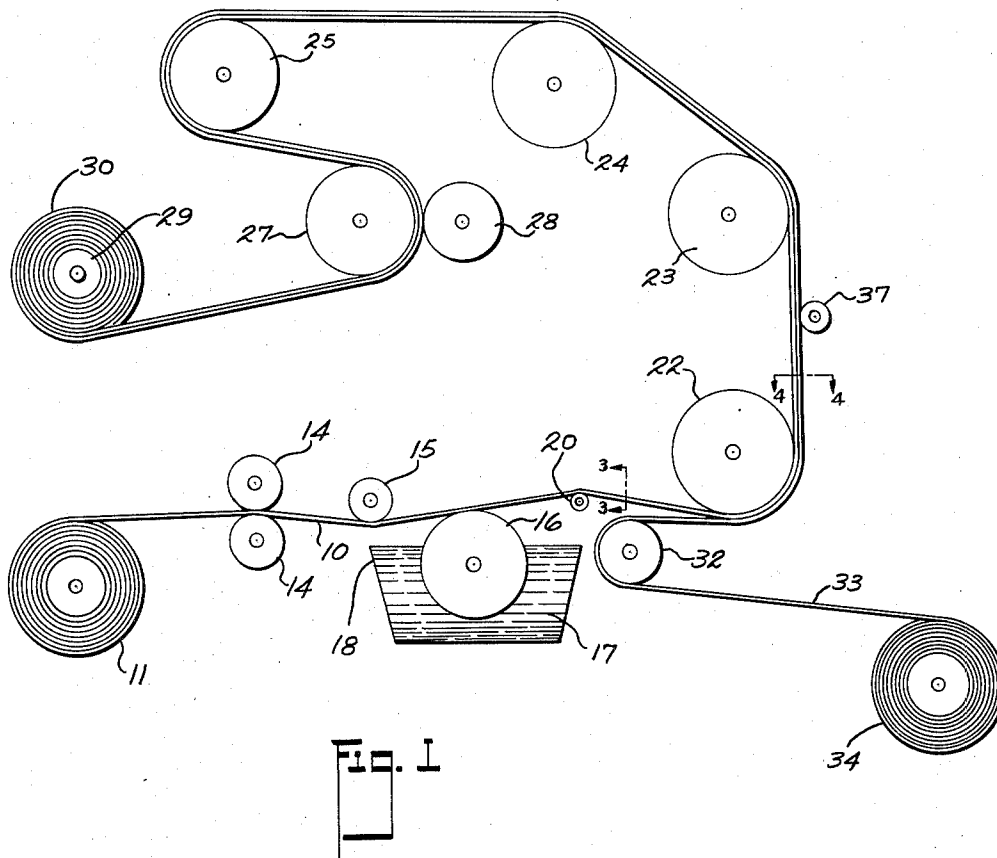


Fig. 1

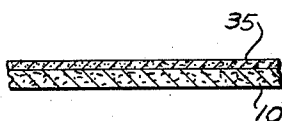


Fig. 3



Fig. 4

INVENTOR.
WALTER J. STOLLE, JOSEPH H. GLASER,
ARTHUR G. KJELLSTRAND & LEONARD J. IMMKE
BY
RICHEY, WATTS, EDGERTON & McNENNY

ATTORNEYS

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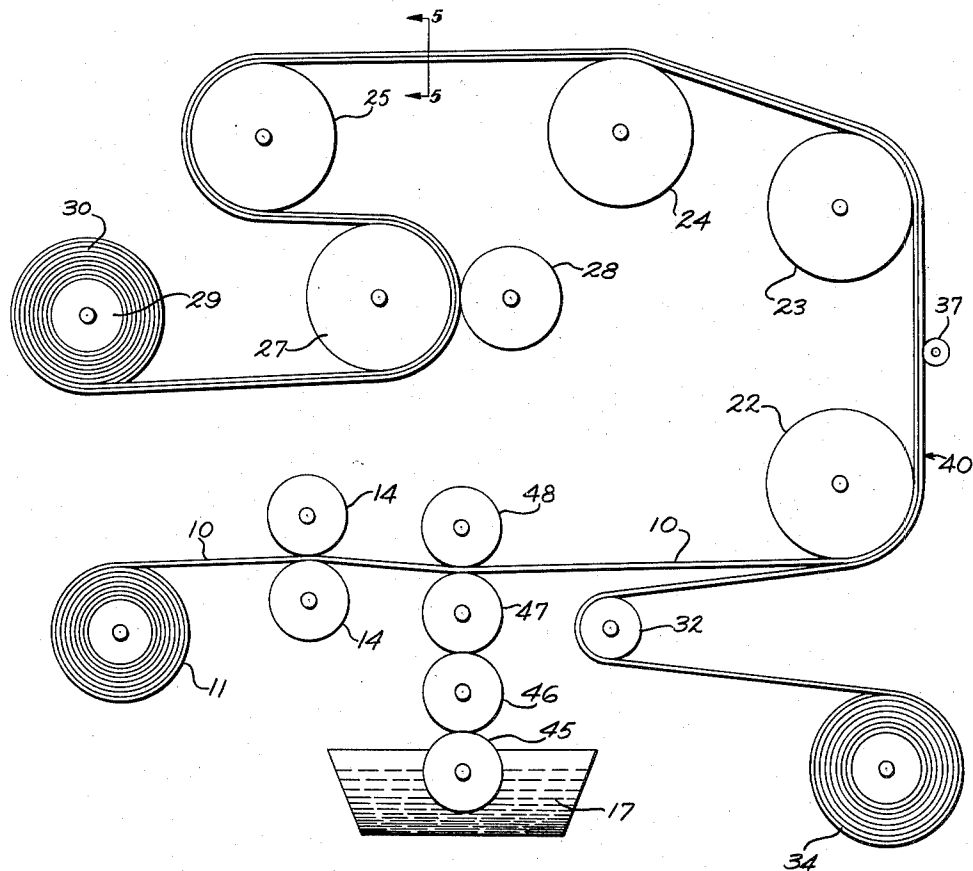


Fig. 2

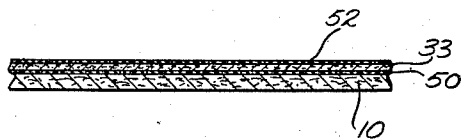


Fig. 5

INVENTOR.
WALTER J. STOLLE, JOSEPH H. GLASER,
ARTHUR G. KJELLSTRAND & LEONARD J. IMMKE
BY
RICHEY, WATTS, EDGERTON & MCNENNY

ATTORNEYS

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METHOD OF MAKING AN IMPRESSION MEDIUM

Walter J. Stolle, Cleveland, Joseph H. Glaser and Arthur G. Kjellstrand, Lakewood, and Leonard J. Immke, Warrensville Heights, Ohio, assignors to The Buckeye Ribbon & Carbon Company, Cleveland, Ohio, a corporation of Ohio

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2 Claims. (Cl. 154—138)

The present invention relates generally to the copy-making art and is more particularly concerned with a novel copy-making medium, a unique method of manufacturing this medium and a new apparatus implementing that method.

The requirements of copy-making media in autographic registers and in other pencil and business machine applications where long life under severe conditions is of primary importance are such that the ordinary carbon papers are not at all satisfactory for this service. The closest approach to a practical answer to this demand and virtually the only commercially available, heavy-duty, copy-making medium is of the type disclosed and claimed in U. S. Patent No. 2,263,196, granted November 18, 1941. This patented medium is far superior to anything heretofore known for this kind of service, being capable of much longer useful life than ordinary carbonized papers. However, because of certain difficulties and limitations inherent in or imposed by its manufacture, this patented medium has not been wholly satisfactory under all conditions of use and it has presented substantial problems to both the manufacturer and the user. For one thing, there is an unavoidable lack of uniformity in the finished product leading to exhaustion of portions of the medium at early or intermediate stages of use. Also, where the ink deposit is too thick or heavy, this medium is likely to be torn through adhesion to the copy sheet and thus destroyed. Still further, in the manufacture of this medium according to the method illustrated and described in the said patent, frequent web breakage is inevitable due to the action of the equalizer element in removing excess ink from the freshly-inked, laminated, sheet assembly.

By virtue of the present invention, the shortcomings and the derelictions of the prior art can be eliminated for the first time and this result can be obtained without the introduction of any off-setting disadvantage in the manufacture of these heavy-duty, copy-making media. Still further, the novel copy-making media of this invention are capable of producing copies of legibility at least as good as that which is obtainable through the use of media of this general type heretofore known. In addition, this invention enables the employment of paper-like material which is substantially thinner, more porous and more delicate than the thinnest papers which could be used in commercial manufacture in accordance with the teachings of the aforesaid patent. In fact, fuzziness in copies which is primarily a function of web thickness, can be very materially reduced or virtually eliminated by reason of the present invention, which permits the use of web fineness beyond anything that has ever been successfully used in the commercial manufacture of copy-making media, to the best of our knowledge.

The applicants' present invention embodies the novel concept of floating a web of thin, porous tissue upon an ink layer carried by a suitable backing sheet. Coupled with this concept is the related novel idea of pressing or

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ironing the floating web against the backing sheet through the intermediate ink layer, thus producing a laminated web and sheet assembly with an ink layer of substantially uniform thickness sandwiched between the papers. The pressing operation, accordingly, involves the extrusion of a portion of the ink coating through the porous web so that final assembly bears a coating of ink distributed substantially uniformly over the entire web element surface.

It will be understood, therefore, that in general the method of this invention comprises the steps of applying a carbonizing ink composition to one side of a sheet of substantially non-porous paper-like material and thereby forming a continuous coating of ink on that sheet, bringing a web of substantially porous paper-like material into contact with the ink coating and floating the said web on that coating, and finally pressing the resulting assembly and bringing the sheet and web more closely together while extruding a portion of the ink coating through the web.

Preferably, the method of this invention is carried out continuously, using long strips of sheet and thin, porous web material which are delivered in roll form for processing by this method, the resulting product of this invention being collected in roll form in accordance with general practice in the rotary printing art. Accordingly, each step of the method outlined above is carried out in a continuous manner so that the entire lengths of the sheet and the web are processed with succeeding increments following through the several processing stations so that the final product is of the uniformly high quality stated above.

The said product of this invention in general comprises a backing layer of substantially non-porous, paper-like material, a working face of substantially porous, paper-like material and a continuous layer of ink of substantially uniform thickness disposed between the backing layer and face and holding said layer and face in spaced relation to each other over substantially their entire areas. Preferably, this medium also is provided with a body of ink which is disposed in the pores of the working face material and as a coating of substantially uniform thickness and distribution over the outer surface of the working face.

Apparatus of this invention which is especially adapted for carrying out the novel method hereof and for the production in an efficient and dependable manner of the new copy-making medium thereof, comprises, in general, a driving means which includes a pair of rollers for gripping a continuous sheet and moving it to a predetermined location or station to receive a coating of ink. In addition, this apparatus includes ink-applying means comprising an ink reservoir and an inking roller to receive ink from the reservoir and to transfer that ink to one side of the passing sheet. Means are also provided, including a driven roller, for bringing a second continuous sheet continuously into contact with ink coating carried by the first sheet. Finally, the apparatus includes pressing means to engage the resulting laminated assembly and move the two sheets closer together while substantially uniformly distributing the ink between the two sheets.

Those skilled in the art will gain a further and better understanding of the present invention and the foregoing and additional advantages thereof on consideration of the following detailed description, reference being had to the drawings accompanying and forming a part of this specification, in which:

Fig. 1 is a semi-diagrammatic, side-elevational view of apparatus embodying this invention in a preferred form;

Fig. 2 is a view similar to Fig. 1 of an alternative form of apparatus of this invention;

Fig. 3 is an enlarged, fragmentary, sectional view of a copy-making medium of this invention at an intermediate stage of its production indicated at lines 3—3 of Fig. 1;

Fig. 4 is an enlarged, fragmentary, sectional view of the said copy-making medium at a later stage of its production indicated at lines 4—4 of Fig. 1 and 5—5 of Fig. 2.

Fig. 5 is an enlarged, fragmentary, sectional view of a typical copy-making medium of this invention in final finished form.

As shown in Fig. 1, an elongated sheet of suitable paper-like, backing material 10 is delivered as a roll 11 to apparatus of this invention and disposed between a pair of opposed brake or tensioning rolls 14, over a positioning roll 15, an inking roll 16 partially immersed in a suitable ink composition 17 contained in an open vessel 18, over an equalizer rod or coating knife 20, a second positioning hot driven roll 22, a series of driven chill rolls 23 and 24, a driven positioning roll 25, between a pair of opposed pull rolls 27 and 28, and finally on a wind-up roll 29, on which the finished laminated copy medium product of this invention is to be gathered and wound as roll 30. In addition, this apparatus includes a positioning roll 32 over which a thin, porous, continuous web 33 of suitable material delivered as a roll 34 is run preparatory to engagement with freshly applied ink coating 35 (Fig. 3) carried by backing 10 leaving equalizer rod 20. Pressing means comprising a roller 37 disposed substantially midway between rolls 22 and 23 and opposed to those rolls bears against the web or working face of the resulting laminated assembly 40 to make the ink layer 35 between the sheet and web of substantially uniform thickness and to extrude excess ink in that layer through the pores of web 33 and distribute it substantially uniformly over the outer surface of said web.

The apparatus illustrated in Fig. 2 differs from that of Fig. 1 essentially only in respect to the means by which the ink is applied to backing sheet 10. Thus, instead of using equalizer rod 20 or a coating knife for removal of excess ink following the application of an overly thick ink layer, an inking roll 45, a transfer roll 46, an applicator roll 47 and an impression roll 48 are employed to insure the application of a predetermined amount of ink to sheet 10. The necessity for equalizer rod 20 or its equivalent, as well as for positioning roll 15 has thus been eliminated.

It will be clear in view of the foregoing apparatus descriptions, that the method of this invention can be carried out in both the illustrated forms of our apparatus. Thus, assuming backing sheet 10 and web 33 to be threaded through the travel course defined by the various roll elements, it is seen that sheet 10 is fed continuously to the ink-applying stations in Figs. 1 and 2 and, depending upon the apparatus used, is run continuously in contact with rod 20 or is brought directly into contact with the web which is run continuously and substantially at the same rate along the common travel course beginning at roll 22. Also, it is seen that sheet 10 and web 33, running together with the intermediate ink layer 35 uniting them, are delivered as an unitary assembly into contact with the roll 37 which accomplishes the essential and novel pressing, extruding and smoothing functions described above. Thereafter and before the ink has had an opportunity for redistribution to destroy uniformity of the freshly-prepared product, the assembly is continuously run over the chill rollers by means of which the ink composition is reduced to substantially room temperature and is hardened and set to a predetermined degree preparatory to winding the product for storage or shipment and use.

As indicated above, the application of ink composition at an elevated temperature is contemplated by the present invention and is suitably carried out through the use of reservoir 18 equipped with suitable conventional heating means in accordance with custom in the paper carbonizing industry. Likewise, the chilling result noted above is accomplished through the use of suitable conventional means known to those skilled in the art.

The ink composition employed in accordance with the preferred practice of this invention is one having the following composition:

	Parts
5 Carnauba wax -----	15
Sugar cane wax -----	10
Castor oil -----	28
Diglycol laurate -----	5
Victoria pure blue -----	6
10 Mineral oil -----	6
Calcium carbonate (one to ten micron size) -----	30

It will be understood, however, that other carbonizing ink compositions may be employed without departing from the spirit of this invention or the scope of the appended claims.

The backing layer used in accordance with this invention in the manufacture of these novel media is suitably conventional carbonizing tissue but may be any substantially non-elastic and non-porous material such as cellophane and various synthetic films affording an ink-accepting base. The various mixtures of rag and chemical pulp papers in wide use in the production of ordinary carbon paper are quite satisfactory for use in this invention but preferably for billing machine use a rag pulp paper is used, while for pencil use sulfite pulp will generally be found most satisfactory. In any event, however, as indicated above, the material used for this backing element should show no tendency to stretch.

The webs employed in the manufacture of the media of this invention may suitably be of material or synthetic fibers which are adaptable to production of open weave tissues having good strength characteristics. The fibers should have surfaces which are wettable by the inks used but they need not be absorbent and they may be flexible to some extent compared to the backing sheet material fiber. Also porosity is an important feature of these webs and it is desirable that they be smooth to assure good, clear copies. By way of example, a web which is well suited for this purpose weighs about one pound per 91 square yards, i. e., $2\frac{1}{4}$ to $2\frac{1}{2}$ pounds per 500 sheets of 20 inch by 30 inch size. This is substantially lighter and thinner than standard mimeograph stencil which may be used in this manufacture but is not preferred.

In respect to Figs. 3 to 5, inclusive, it is important to note not only the sequence of the steps leading to the assembly constituting the final novel product of this invention, but also to note the fact that in contrast to products of this type in the prior art, there is, at no time, any direct contact between sheet 10 and working face or web 33. In other words, ink is always present as a continuous layer over essentially the entire areas of these two paper-like material elements of this combination and while a certain amount of ink normally is squeezed from between the two elements, it is only for the purpose of making this intermediate layer uniform in thickness that this is done and not for providing any direct contact or anchoring effects. As shown in Fig. 5, ink layer 35 of Figs. 3 and 4 has been converted into a layer 50 which is substantially thinner than layer 35 and is quite uniform over the entire area of the medium. Ink displaced from layer 35 in this conversion operation appears in this view as an upper layer 52 covering web 33. Actually, layers 50 and 52 are united through the pores and openings of web 33, although in the interest of clarity this has not been illustrated in Fig. 5, the principal purpose of which is to show the critical and novel relationship between backing 10, ink layer 50 and web 33, described above.

Having thus described the present invention so that those skilled in the art may be able to understand and practice the same, we state that what we desire to secure by Letters Patent is defined in what is claimed.

What is claimed is:

1. The method of making a copy-producing medium which comprises the steps of applying a carbonizing ink composition at elevated temperature and in the liquid

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phase to one side of a backing sheet of substantially non-porous paper and thereby forming a continuous coating on said backing sheet, bringing a web of substantially porous paper into contact with the ink coating before the ink has cooled and set, heating the ink layer of the resulting assembly, then promptly firmly pressing the said assembly and extruding ink through the web and moving the web toward the backing sheet to provide an ink layer of substantially uniform thickness between the said web and sheet, and cooling the pressed laminated assembly and hardening the ink on the surface of the assembly and between the web and the backing sheet while the web and sheet are maintained in uniform spaced relation to each other.

2. The method of making a copy-producing medium which comprises the steps of applying a carbonizing ink composition at elevated temperature and in the liquid phase to one side of a backing sheet of substantially non-porous paper and thereby forming a continuous coating on said backing sheet, bringing a web of substantially porous paper into contact with the ink coating before the ink has cooled and set, firmly pressing the said assembly

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while the coating is in liquid form and extruding ink through the web and moving the web toward the backing sheet to provide an ink layer of substantially uniform thickness between the said web and sheet, and chilling the pressed laminated assembly and hardening the ink on the surface of the assembly and between the web and the backing sheet while the web and sheet are maintained in uniform spaced relation to each other.

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