

July 7, 1953

F. J. RUSSELL, JR

2,644,778

METAL FOIL MATRIX

Filed Jan. 7, 1950

Fig. 1

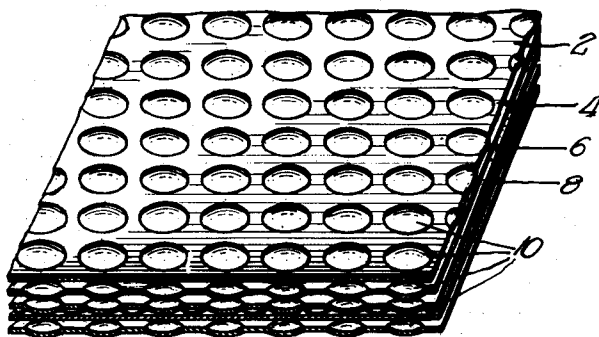


Fig. 2

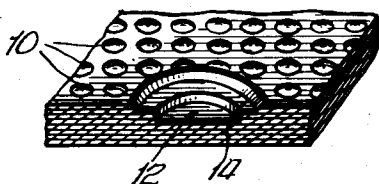


Fig. 3

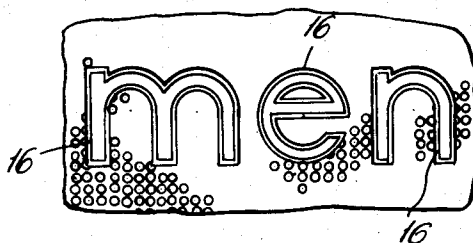
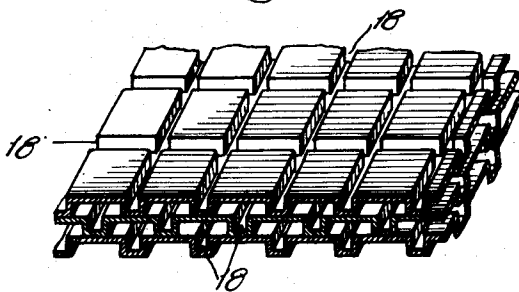


Fig. 4



INVENTOR.

Frank J. Russell, Jr.,

BY

Wilkinson, Hylby, Bryan, & House
attys.

UNITED STATES PATENT OFFICE

2,644,778

METAL FOIL MATRIX

Frank J. Russell, Jr., Marquette, Mich.

Application January 7, 1950, Serial No. 137,434

10 Claims. (Cl. 154—46.5)

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This invention relates to stereotype mats, and more particularly to mats which are adapted to be inserted in a typewriter to have type impressions formed therein.

The most widely used type of stereotype mat or matrix is made up of a plurality of layers of cellulose fibers felted together, along with other suitable ingredients which improve the finished product. Such mats may be of the so-called "wet mat" type or the "dry mat" type, but in any event, the manner of utilizing each of these types is substantially the same. As soon as a form containing the type has been set up, a stereotype mat is placed thereon and then covered with blankets or felts and passed through a rolling machine whereby the mat receives a reverse impression of the type. The mat, after suitable drying, is placed in a casting machine where it is held in the form of a cylinder. Molten stereotype metal is then poured into the casting machine whereby a metal cylinder or semi-cylinder is obtained which contains on its outer surface an exact duplicate of the type in the original flat form. This stereotype plate may then be placed in a rotary press and copies of the printed material can be produced at a high rate of speed. Several casts can normally be made from the same mat so that a number of presses can be placed in operation almost simultaneously if desired.

The form containing the type referred to above from which the mat receives its impression is normally made up of lines of type produced by a Linotype machine or similar device which automatically casts lines of type from molten metal as it is being operated. Needless to say, devices such as Linotype machines are very expensive, and therefore any method of preparing a matrix such as described without the necessity of using such a machine would be very desirable. For example, if an ordinary typewriter or an electric typewriter could be substituted for a Linotype machine, a very substantial expense could be eliminated.

It is therefore an object of this invention to provide a foil mat for use as a matrix in forming stereotype plates, which mat is adapted to be inserted in a typewriter to have type impressions formed therein and which can subsequently be used to form printing plates, either in a flat or circular form, or may be used to form plates of type which can in turn be used to form the conventional type of matrix from which the stereotype plates normally are formed.

It is a further object of this invention to pro-

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vide a matrix of the character described which needs no conditioning prior to the formation of type impressions therein, since its operation is entirely independent of such factors as moisture content, which is so critical a factor in the type of matrices commonly used today.

Another object of this invention is to provide a foil mat matrix of the character described which is both simple in construction and relatively inexpensive to produce.

Another object is to furnish a matrix which can be used with suitable liquid plastic materials which set up quickly to form plates of type without the use of heat or pressure.

Further objects and advantages of this invention will become evident as the description proceeds and from an examination of the accompanying drawing which illustrates one embodiment of the invention and in which similar numerals refer to similar parts throughout the several views.

In the drawing:

Figure 1 is a perspective view of a greatly enlarged section of a matrix embodying one form of the invention;

Figure 2 is a perspective view of a greatly enlarged section of a matrix of the type shown in Figure 1 showing the form of impression produced therein by striking the surface thereof with the type of a typewriter;

Figure 3 is an enlarged plan view of a portion of a matrix of the type disclosed in Figure 1 showing several impressions thereon made by the type of a typewriter; and

Figure 4 is a greatly enlarged perspective view of a section of matrix embodying an alternative form of the invention.

Turning now to Figure 1, the greatly enlarged matrix illustrated therein is formed of a plurality of layers of metallic foil such as the layers 2, 4, 6 and 8, each such layer having a plurality of closely spaced, substantially vertical deformations 10 formed therein. The layers of metal foil are superposed as shown so as to form a mat having a more or less cellular structure. The resultant mat is, for example, of much greater depth or thickness than a similar mat would be if made up of the same number of layers of foil which did not have the expanded thickness as described resulting from the presence of a plurality of relatively minute deformations in each sheet.

The plurality of foil layers may be formed into a mat by any suitable means. It has been found that no adhesive agent is required between the

individual foils, and a very satisfactory method is to merely bind the layers together along the edge by suitable crimping or edge binding of some suitable character. Satisfactory mats have been formed also by merely folding sheets over on each other and relying only on the frictional contact of the individual layers and the folded edges to maintain the layers in proper alignment. Mats have been formed with very thin coatings of adhesive between the layers of foil, however, which have also been found to be satisfactory, although not representing a necessary construction.

The mat so formed provides a sheet of material which may be inserted in an ordinary typewriter and by striking the desired keys thereof any combination of letters may be impressed in the mat. When each key strikes the laminated sheet or mat, it forms a very clean-cut impression of the type carried by the type bar and normally does so without rupturing the surface of the mat and without deforming the rear surface thereof. Depressions are thus formed in the mat of the exact shape of the type without rupturing or straining the sheet, and the displacement of the material in the various layers incident to the production of these depressions is localized in such a way, due to the cellular construction thereof, that the immediately adjacent areas are unaffected, which areas must necessarily be kept intact for receiving the impressions or characters of other letters.

The unusual and very desirable effect thus achieved is apparently the result of the preliminary deformation of particularly the upper layers of material, and thus providing an excess of vertically deformable material at any particular point so that the depressions made by the type may be formed readily without undesirable effects, such as rupturing of the foil. This preliminary deformation of the foil may be conveniently referred to as "depth expansion" thereof, and the term will be so used throughout this specification.

The section of matrix illustrated in Figure 2 is a greatly enlarged portion of a mat which has been struck with the type bar of a typewriter carrying the "period" character, and the formation of a depression 12 having that particular form is well illustrated therein. The areas 14 immediately surrounding the actual type character also are depressed slightly, as shown, which effect has been found to be more pronounced in the relatively small characters, such as the "period", than in the formation of the larger characters, such as letters and the like. These, however, also have this slight deformation 16 at their periphery (as shown in the plan view, Figure 3), although the impression of the character itself is clean-cut and smooth, and the ultimate result of these slight peripheral depressions 14 and 16 is merely that the type which is cast from the matrix will be raised slightly higher than it would be if the impressions formed consisted only of the actual configuration of the type and were therefore not quite so deep. This actually is desirable, since it insures the cast type impressions of being clear of possible slight inadvertent deformations in the matrix and therefore in the plate of cast type. In any event, the printing surface, or highest portions, of the cast type corresponds to the lowermost portions of the depressions, which portions are thus formed in the manner which makes them very clean-cut and free from undesirable deformation.

Both before and after the matrix has the type impressions formed therein, it possesses adequate physical strength to enable it to be easily handled during the necessary operations in the printing process, such as placing it in the typewriter, passing it therethrough and subsequently casting the plate of type therefrom.

As shown in Figures 1 and 4, various forms of vertical deformations in the foil may be utilized to produce the depth expansion of the layers. In Figure 1, for example, the deformations are in the form of very small cuplike pockets or dimples 10, whereas the surface of the foil, shown in Figure 4, has been given a more or less reticulated form resulting from a plurality of very fine scoring lines 18 being formed therein running horizontally and vertically of the sheet. A mat made up of a plurality of layers of either of these types of depth expanded foil has a rather unexpected soft flexibility approaching that of heavy cloth. Obviously any manner of vertical deformation is suitable as long as it provides the excess of deformable material at any one point in the upper surface of the matrix.

The foil utilized in forming the matrix may be made of any suitable metallic material, such as aluminum, tin, lead, and various alloys, such as lead and tin; lead and antimony; lead, tin and antimony; and lead, antimony, zinc and copper. The gauge of the foil will necessarily vary with each particular material and the relative softness thereof. However, as an example, it has been found that when aluminum is utilized it is not practical to use foil thicker than .02 of an inch. Very satisfactory results have been obtained utilizing aluminum foil having a thickness of approximately .002 of an inch. This thickness refers to the usual gauge of the smooth surface foil, and is not indicative of the increased depth of the sheet resulting from the embossing described above, since in the case of this aluminum foil, for example, it has been found possible to give a sheet .002 of an inch thick an effective thickness of approximately .007 of an inch by proper depth expansion of the character described.

This latter expansion was produced by using a Ben Day screen of about 65 lines to the inch engraved to a depth of about .005 of an inch. A greater expansion would undoubtedly be possible if a more deeply engraved plate were used. To obtain the embossing, the foil was placed on the metallic Ben Day plate, and on top of the foil so placed was placed (a) a thin sheet of rubber, (b) a sheet of cork, (c) a sheet of fibre, and the whole mass then subjected to a pressure of about 3000 pounds per square inch with a suitable pressure roller.

The rubber, cork and fibre layers apparently act under pressure in such a way as to force the foil into the Ben Day design which results in the foil itself having such a design formed therein. In mass production of such a foil, undoubtedly the smooth foil could be passed between two rollers, namely, a metal roller engraved with the Ben Day design and the other covered with cork and rubber.

The foil which is utilized apparently can be as thin as is felt to be desirable, although obviously the thinner the foil layer, the more layers that will be required to make up a suitable mat. It should be understood also that this invention is, of course, not restricted to any particular number of layers of foil in the laminated mat, the only requirement being that a sufficient number

of layers must be employed to give the depth of metallic material required for the form and size of type which is to be employed to impress the matrix. Obviously, the more layers that are utilized, the thicker the mat will be, and the deeper the type impression which can be formed therein. By way of illustration, satisfactory work has been done in making plates for newspaper printing on a rotary press using a mat having between 9 and 16 layers of aluminum foil having relatively minute, substantially vertical deformations therein in the form of a myriad of small, dimple-like depressions arranged in closely spaced rows, as shown in Figure 1.

Of course, when a suitable backing sheet is utilized, as has been found to be possible, the number of sheets of foil required is correspondingly reduced. The mat should incorporate, however, at least one surface sheet of metal foil which is reticulated or otherwise deformed, preferably according to a suitable, predetermined pattern, to supply an excess of deformable foil material at any particular point which in turn permits the foil to yield when struck by type and to form depressions corresponding to the shape of the type, without actually rupturing or straining the foil to the rupture point. If a backing material is substituted for some of the metal foil sheets below the impressed surface of the mat, it must be quite similar to those sheets which it replaces in its physical characteristics so that, in addition to supporting the metallic surface sheet or sheets, it will at the same time permit the proper deformation thereof, and will also be deformable itself within the confines of its own depth.

In other words, the backing material must have characteristics similar to the embossed foil sheets which it is used to replace, at least in effect. This may be provided by utilizing backing material having air cells or spaces within its internal structure. Cellulose wadding is a type of material which conforms to this definition, although if utilized, such wadding should be impregnated with a wax or similar rigidifying or yielding substance. Other cellulosic substances have been found to be suitable, such as cardboard, blotting paper, and the like. No attempt is being made to define all of the possible structures and materials which will produce a backing of the type defined. It should be understood, however, that the invention in its broadest concept should include any form of suitable backing which gives the action here described, namely, that of permitting a displacement through bodily movement or flexibility of the mass constituting the backing layer, into spaces also contained within the confines of the backing layer, so that the metallic surface sheet or sheets can be in deformed and thus protrude into the backing layer without causing that backing layer to be displaced beyond the confines of its normal dimensions. This characteristic of the backing layer, in turn, prevents the metallic sheets from being ruptured.

The lack of necessity for further defining the type of backing material which may be utilized should be clear from the fact that the vertical deformation of the metallic foil which is utilized as an upper surface of the matrix is needed primarily to supply excess of deformable metal, whereas when a laminated mat, made up of a plurality of layers of metal foil alone is employed, the depth expansion in the underlying metal foil sheets which constitute the backing for the mat is utilized primarily for its cellular structure

rather than to supply an excess of deformable metal. With this difference in mind, it can readily be seen that the main purpose of the backing sheet or sheets, when not depth expanded metal foil, is still to provide an intercellular structure, and therefore an opportunity for variation as to structure and materials employed is present.

The matrix described may have the desired type impressions formed therein in a typewriter in substantially the same amount of time that any sheet of typing may normally be prepared. This in effect means that a matrix from which a plate of type may be cast can be formed directly, without first having to assemble a plate of type in some manner or other, such as through the use of a Linotype machine. Moreover, the matrix so directly formed can be utilized to cast a printing plate which can be used for printing copies of the material or a plate of type which can subsequently be utilized for the formation of the conventional type of matrix from which printing plates can be made.

The fact that the impressed matrix can be formed readily in a typewriter is a very great advantage, but in addition to that distinct advantage, the foil matrix provides an equally outstanding one in the preparation of a molded plate of type from it. The foil mat matrix can be used with a number of very desirable flowable plastic materials which set up quickly to form plates of type and which do not require the application of either heat or pressure thereto in the molding process.

Obviously a foil matrix of the type described is not suitable for use with molten type metal. Such a matrix does lend itself to the use of a suitable flowable plastic material which can be poured, while cold, directly onto the foil matrix, however, after the type impressions have been formed therein and which preferably will harden quickly to form a plate of type without the use of heat or pressure. One such method involves the use of a gypsum material known as "Hardite," which is a substance widely used for making dental molds and is supplied, for example, by the Wiggins Company of Bloomfield, New Jersey. This material may be mixed with water to form a slurry having a consistency of about that of melted ice cream. The previously impressed matrix is preferably supported on a casting box having upstanding side walls, which determine the thickness of the finished plate, and a hinged top which may be brought into place on the side walls in a manner which extrudes the excess material. The casting box is also preferably mounted so that it may be rapidly vibrated during the casting operation, which vibration causes any entrapped air to move out of association with the impressed foil and up toward the top of the molding box. Intimate contact is thus assured between the liquid Hardite and the pressed foil.

The Hardite sets up in a very short period of time, somewhat like plaster of Paris, and it has been found that in approximately 10 minutes it normally has become hard enough to permit the foil matrix to be stripped therefrom and a light weight plate of type results. Additional removal of moisture from the plate is ordinarily necessary, however, to give the Hardite additional hardness, but care must be taken not to over-dry it, as it will then become brittle. The preferred method of drying is that of heating the Hardite in an oven maintained at approximately 200° F. for a period of approximately ten minutes. The plate so formed can then be used as a plate of

type for producing matrices of the conventional type as explained above.

As also mentioned in the co-pending application referred to above, a more desirable plastic material, in many respects, for use substantially in the manner described, is methyl methacrylate. This material is advantageous in that it requires no heating to cause it to set up into a plate which can be readily utilized directly for printing or which can be used for the production of conventional matrices. However, only one methyl methacrylate plate can normally be made from a single matrix of the character described, but due to the fact that this type of plate has very unusual wearing properties and therefore increased life, it will replace in use approximately two conventional metal plates. Also, additional methyl methacrylate plates can be made as required through the utilization of additional foil mats which can be readily impressed from the first methyl methacrylate plate rather than being formed in a typewriter. In this way any number of plates can be produced with very little expense and difficulty. These new foil mats can be produced from the methyl methacrylate plate with only very slight pressure. This is important, since extreme pressure is required to make the conventional type of dry mats from the plate of type, with the result that only about 15 conventional mats can be made without damaging the type beyond the point of further use.

These light weight, cold-set plastic plates cannot be made from the conventional type of matrix discussed above. This limitation is particularly significant in the light of the fact that it is the practice today to keep in storage printing patterns made of type metal for use in making reprints of previously published material, as the need arises. Some of the larger publishing companies, for example, have great amounts of capital tied up in metallic patterns, both in the relatively costly patterns themselves and the expensive structures required to satisfactorily store and support such heavy material. The substitution of light weight methyl methacrylate plates, for example, for those plates of metal would provide a means of producing and storing printing plates at a fraction of the present cost, by the great reduction in space requirements and weight handling, in addition to the much lower cost of materials.

Although, for purposes of this discussion, we have treated the plastic plates as being formed in only one piece, it should be obvious that a laminated structure could be utilized, since it might be desirable to provide the plastic with a suitable backing of other material. Because the hardened plastic surface of the methyl methacrylate plate is capable of withstanding high pressures, it is possible, for example, to secure a sheet of suitable pressure sensitive plastic or thermo-plastic material to the back thereof. This has the additional advantage of assuring a perfectly smooth back for the finished plate, which is normally essential for accurate printing or stereotyping. Such a procedure permits the use of a plastic for the surface of the printing plate which produces an excellent printing surface without damage to the matrix, such as the methyl methacrylate, while a material particularly suited for use as a backing material may be utilized in combination with the ideal printing surface material.

What is claimed is:

1. A flexible, malleable, laminated foil mat for use as a matrix for stereotype plates, which mat

has dimensional stability and is adapted to be inserted in a typewriter to have type impressions formed therein comprising a plurality of superposed layers of deformable thin metallic foil, each layer having throughout substantially its entire surface a plurality of relatively minute protuberances of a height and being spaced from each other a distance comparable to the thickness of said layer, said protuberances providing a substantially increased surface within a particular area of foil, the extended surface of said layers of foil adapting said matrix to receive without rupturing a plurality of relatively deep impressions when struck with the type on selected type bars of a typewriter.

2. A flexible, malleable matrix for stereotype plates having dimensional stability and being adapted to be inserted in a typewriter to have type impressions formed therein comprising a plurality of layers of thin deformable metallic foil each layer having throughout substantially its entire surface a plurality of relatively minute protuberances of a height and being spaced from each other a distance comparable to the thickness of said layer, said protuberances providing a substantially increased surface within a particular area of foil, and a compressible, cellular backing therefor, the extended surface of and the compressible backing for said foil adapting it to receive without rupturing a plurality of relatively deep impressions when struck with the type on selected type bars of a typewriter.

3. A flexible, malleable matrix for stereotype plates having dimensional stability and being adapted to be inserted in a typewriter to have type impressions formed therein comprising a plurality of layers of thin, deformable metallic foil each having throughout substantially its entire surface a plurality of closely spaced, relatively minute, depressions formed therein of a depth and being spaced from each other a distance comparable to the thickness of said layer and a compressible, cellular backing therefor.

4. A flexible, malleable, laminated foil mat for use as a matrix for stereotype plates, which mat has dimensional stability and is adapted to be inserted in a typewriter to have type impressions formed therein comprising a plurality of superposed layers of thin, deformable metallic foil, each layer having throughout substantially its entire surface a plurality of closely spaced, relatively minute, depressions formed therein of a depth and being spaced from each other a distance comparable to the thickness of said layer.

5. A flexible, malleable, laminated foil mat for use as a matrix for stereotype plates, which mat has dimensional stability and is adapted to be inserted in a typewriter to have type impressions formed therein comprising a plurality of superposed layers of thin, deformable metallic foil, each layer having throughout substantially its entire surface a plurality of closely spaced depressions embossed thereon, each said depression having an area which is relatively minute with respect to said type impressions and being of a depth and being spaced from each other a distance comparable to the thickness of said layer.

6. A flexible, malleable, laminated mat for use as a matrix for stereotype plates, which mat has dimensional stability and is adapted to be inserted in a typewriter to have type impressions formed therein, comprising a plurality of sheets of thin, metallic foil having throughout substantially its entire surface a plurality of closely spaced, relatively minute protuberances formed

in each sheet of a height and being spaced from each other a distance comparable to the thickness of said sheet, and a relatively rigid but compressible backing sheet having a relatively open structure so that relatively deep impressions may be formed in said surface sheet such as those produced by striking the surface sheet with the type of a typewriter without rupturing the surface sheet and without deforming the exposed surface of said backing sheet.

7. A flexible, malleable, laminated foil mat for use as a matrix for stereotype plates, which mat has dimensional stability and is adapted to be inserted in a typewriter to have type impressions formed therein comprising a plurality of superposed layers of deformable thin metallic foil, each layer having throughout substantially its entire surface a plurality of intersecting line depressions embossed thereon forming in turn a plurality of closely spaced, relatively minute protuberances of a height and being spaced from each other a distance comparable to the thickness of said layer.

8. A flexible, malleable, laminated foil mat for use as a matrix for stereotype plates, which mat has dimensional stability and is adapted to be inserted in a typewriter to have type impressions formed therein comprising a plurality of superposed layers of thin, deformable metallic foil, each layer having throughout substantially its entire surface at least two angularly disposed sets of closely spaced parallel line depressions embossed thereon forming a plurality of closely spaced, relatively minute, protuberances of a height and being spaced from each other a distance comparable to the thickness of said layer.

9. A flexible, malleable, laminated foil mat for use as a matrix for stereotype plates, which mat

has dimensional stability and is adapted to be inserted in a typewriter to have type impressions formed therein comprising a plurality of superposed layers of thin, deformable metallic foil, each layer having throughout substantially its entire surface a reticulated pattern embossed thereon to produce a surface having a plurality of closely spaced, relatively minute, protuberances of a height and being spaced from each other a distance comparable to the thickness of said layer.

10. A flexible, malleable, laminated foil mat for use as a matrix for stereotype plates, which mat has dimensional stability and is adapted to be inserted in a typewriter to have type impressions formed therein comprising a plurality of superposed layers of thin, deformable metallic foil, each layer having throughout substantially its entire surface a plurality of closely spaced parallel line depressions embossed thereon of a width and a depth comparable to the thickness of said layer and being spaced from each other a distance less than ten times the thickness of said layer.

FRANK J. RUSSELL, Jr.

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