# United States Patent

**Morley et al.**

[15] **3,702,400**

[45] **Nov. 7, 1972**


## [54] ADDRESSING APPARATUS


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[22] Filed: **Feb. 18, 1971**

[21] Appl. No.: **116,552**

**Related U.S. Application Data**

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[52] **U.S. Cl.** .....**250/65 T,** 101/47, 117/1.7, 117/3.2, 156/384, 156/387, 156/542, 156/543, 156/552

[51] **Int. Cl.** .....**B41l 45/00**

[58] **Field of Search** .....101/470, 47, 50, 65; 117/1.7, 117/3.2; 156/238, 272, 277, 380, 384, 387, 540, 541, 542, 543, 552; 250/65 ZE, 65 T, 219 L; 209/110



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[57] **ABSTRACT**

There is disclosed an addressing system including an addressing apparatus and addressing methods and materials used therein. A set of master cards is provided formed of porous tab card stock impregnated with a sensitizer vaporizable at 100 °C to 160 °C. and having a selected area on one face thereof for the address in infrared absorbing ink; as disclosed, the master card is made by passing the porous tab card stock through a bath containing the sensitizer and a solvent therefor, after which the solvent is evaporated. The set of master cards is then employed to provide a master tape that is a strip of non-porous release material that is oleophobic and transparent to infrared radiation, and carrying thereon reverse reading copies of the addresses in the form of bodies of partially fused toner applied to one side of the master tape; the addresses are transferred from the master cards to the master tape utilizing a novel apparatus and method wherein a printing station is provided having a first source of infrared radiation thereat, first feed mechanism for feeding the master cards sequentially to the printing station and a second feed mechanism for feeding the master tape to the printing station to position a predetermined portion of the master tape immediately adjacent to the address on a master card positioned at the printing station, thereafter operating the first source of infrared radiation to vaporize from the master card sensitizer in areas corresponding to the address thereon onto the one surface of the master tape, applying a toner to the master tape to adhere toner to the sensitizer in areas corresponding to the address, and thereafter exposing the master tape carrying the powdered toner to a second source of infrared radiation for at least partially fusing the toner to provide a reverse reading copy of the address on the master tape. The toner comprises a vehicle body of wood rosin and polymerized resin, modifiers of polyamide resin and a hydrocarbon resin and pigment of carbon black. The master tape with the addresses thereon in partially fused toner is then fed to an addressing station where an envelop or other article to be addressed is placed with the surface thereof against the partially fused toner on a section of the master tape after which heat and pressure are applied thereto to transfer the bodies of toner to the envelope and fully to fuse the toner to provide on the envelope bodies of fully fused toner in areas corresponding to the address on a master card.


**9 Claims, 7 Drawing Figures**

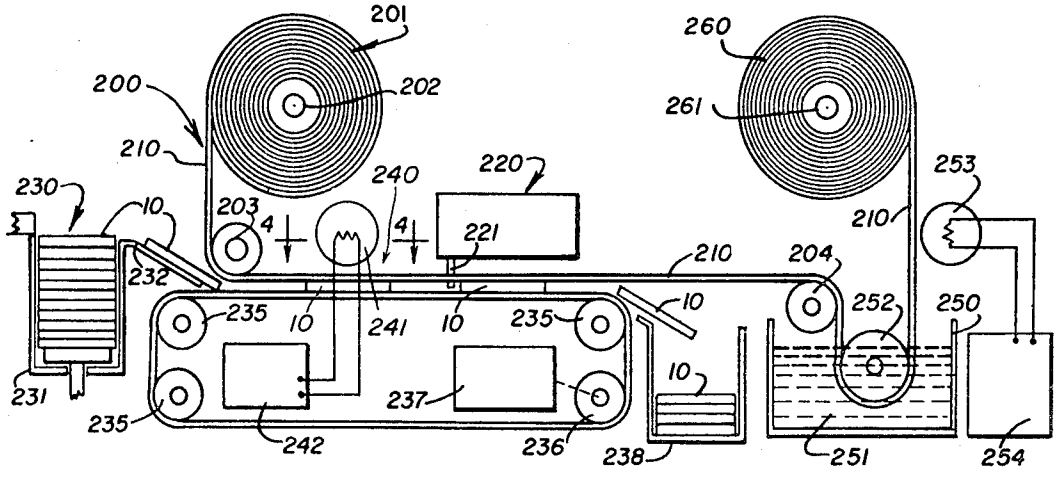

FIG. 1

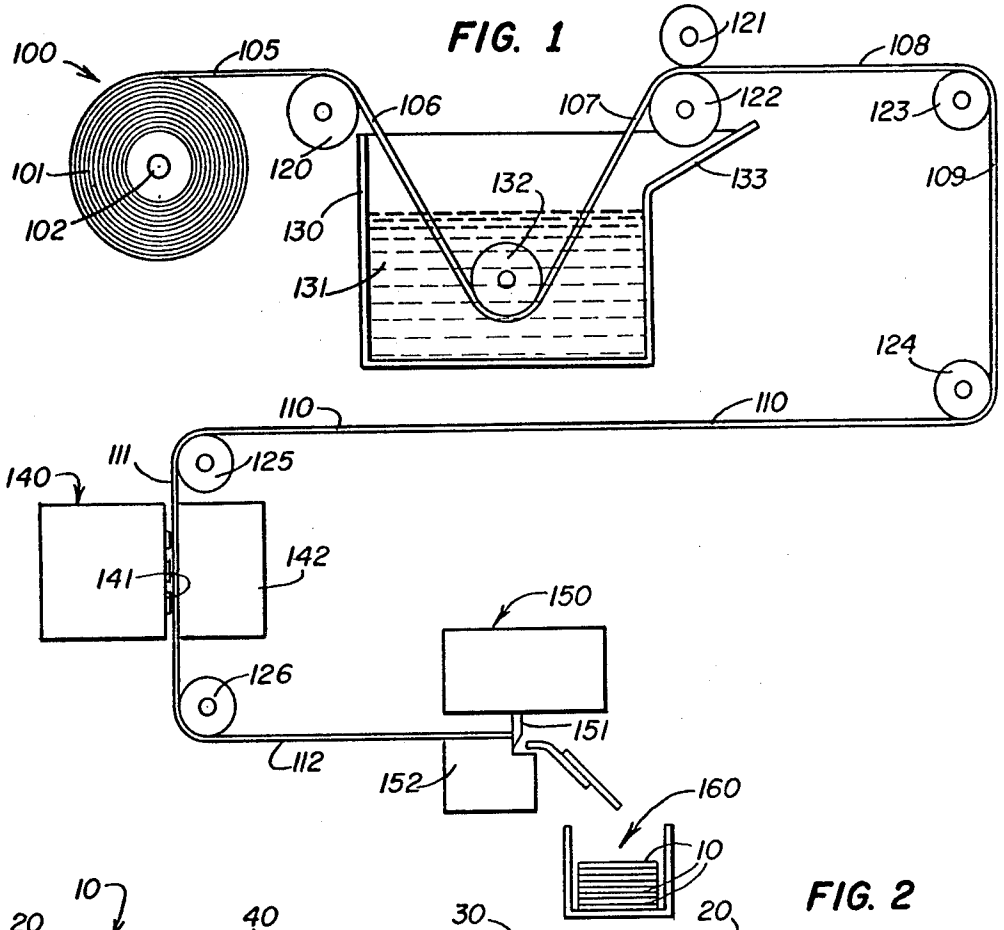


FIG. 2

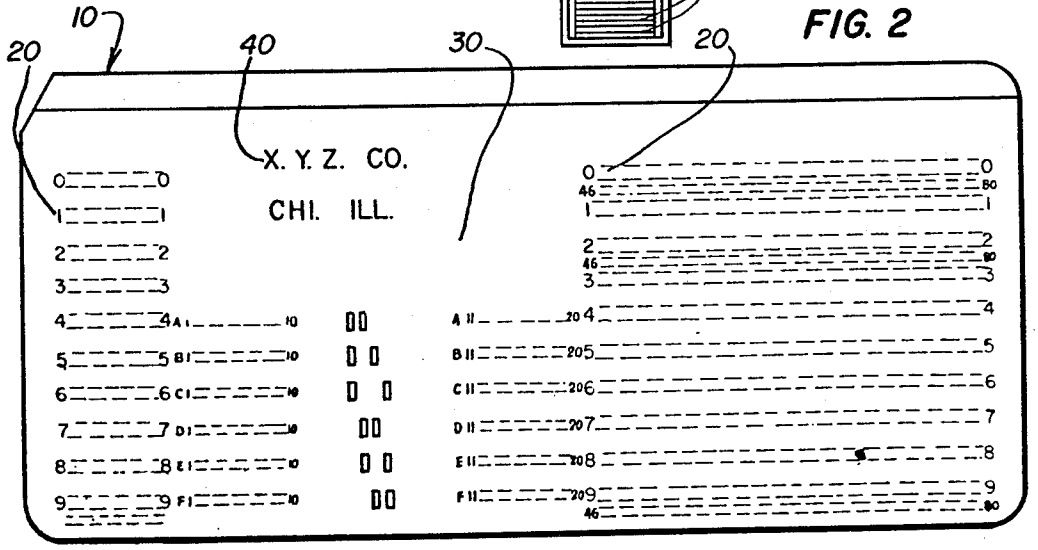


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FIG. 3

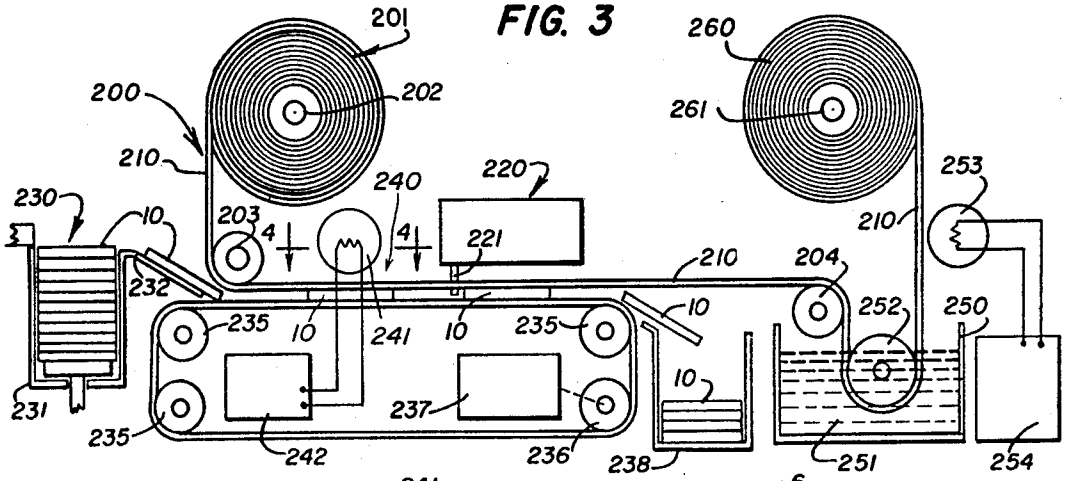



FIG. 4

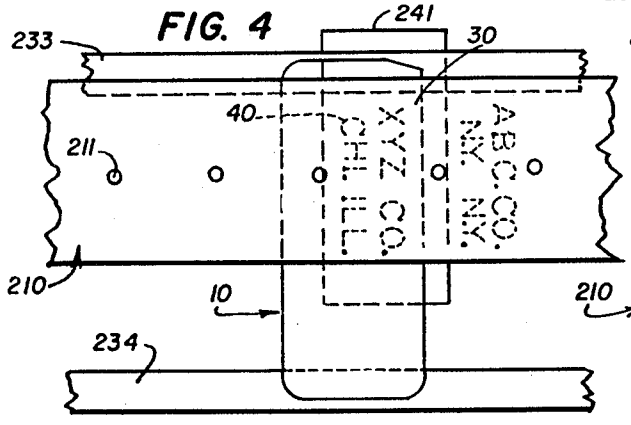



FIG. 5

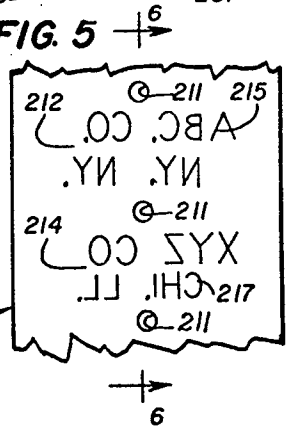



FIG. 6

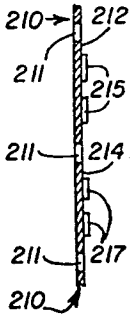
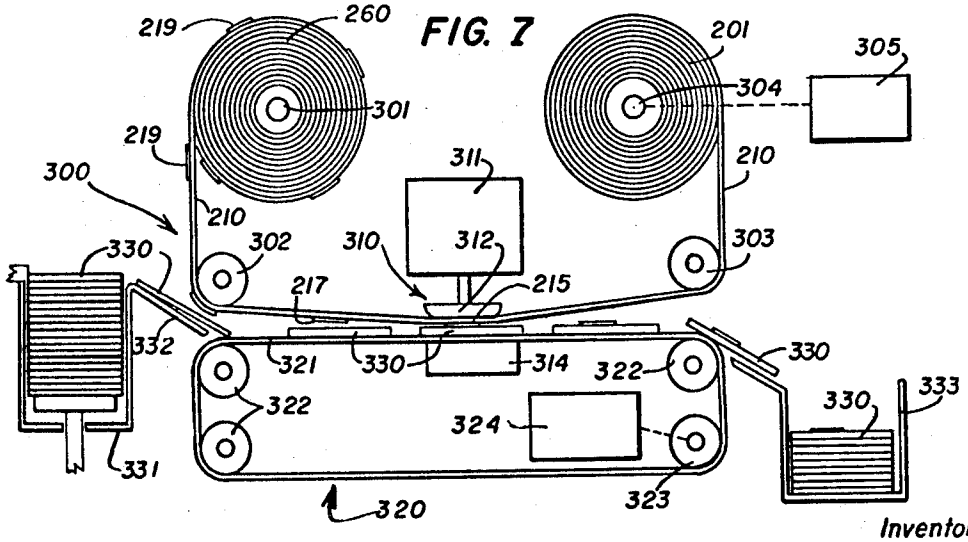



FIG. 7

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# ADDRESSING APPARATUS

This application is a division of the co-pending application Ser. No. 643,718, filed June 5, 1967 for ADDRESSING APPARATUS AND METHODS AND MATERIALS, now U.S. Pat. No. 3,607,527.

The present invention relates to an addressing system, and more specifically to improved addressing apparatus and addressing methods and materials used therein.

It is an important object of the present invention to provide an apparatus for transferring addresses from a group of master cards onto a master tape, wherein each master card has thereon an address in infrared absorbing material and vaporizable sensitizer in the area of the address, and wherein the master tape has a nonporous oleophobic surface having resin release characteristics and is transparent to infrared radiation, the apparatus comprising a printing station having a first source of infrared radiation thereat, a first feed mechanism for feeding the master cards sequentially to the printing station to position a master car with the address thereon in position to be exposed to the first source of infrared radiation, a second feed mechanism for feeding the master tape to the printing station to position a predetermined portion of the master tape with one surface thereof disposed immediately adjacent to the address on a master card positioned at the printing station, means for operating the first source of infrared radiation to vaporize from the master card a portion of the sensitizer from areas corresponding to the address thereon onto the one surface of the predetermined portion of the master tape to provide on the master tape a film of sensitizer arranged in areas corresponding to the address, means for applying a toner to the one surface of the master tape thereby to adhere toner to the sensitizer thereon in areas corresponding to the address, and a second source of infrared radiation for at least partially fusing the toner on the master tape, thereby to provide a continuous master tape having on predetermined portions thereof bodies of partially fused toner in areas corresponding to the addresses on the group of master cards.

In connection with the foregoing object, it is another object of the present invention to provide an apparatus for transferring the partially fused toner on the master tape to a receptor, such as an envelope, the apparatus comprising feed mechanism for feeding receptor sheets sequentially to position a receptor sheet against the bodies of partially fused toner on the master tape corresponding to the address on a master card, and means for applying heat and pressure to the master tape and the receptor sheet to transfer the bodies of partially fused toner to the receptor sheet and fully to fuse the toner thereby to provide on the receptor sheet bodies of fully fused toner in an area corresponding to the address on a master card.

Further features of the invention pertain to the particular arrangement of the apparatus and to the particular characteristics of the compositions, whereby the above-outlined and additional features thereof are attained.

The invention, both as to its organization and method of operation, together with further objects and advantages thereof, will best be understood by reference to the following specification taken in connection with the accompanying drawings, in which:



FIG. 1 is a schematic drawing of the apparatus and method for producing master cards useful with the apparatus of the present invention;

FIG. 2 is a plan view of the front face of a master card made for use with the present invention;

FIG. 3 is a schematic drawing of the apparatus and method for applying to a master tape addresses from a group of master cards, all in accordance with the present invention;

FIG. 4 is a fragmentary enlarged plan view of the portion of the apparatus of FIG. 3 as seen in the direction of the arrows along the line 4—4 of FIG. 3;

FIG. 5 is a plan view of the front surface of a portion of a master tape made in accordance with the present invention;

FIG. 6 is a view in vertical section through the master tape of FIG. 5 along the line 6—6 thereof; and

FIG. 7 is a schematic drawing illustrating an apparatus and method of transferring addresses from a master tape onto envelopes, all in accordance with the present invention.

The addressing system of the present invention utilizes therein a master card **10** as illustrated in FIG. **2**, the master card **10** being generally rectangular in shape and having standard dimensions, such as for example a length of 7 ⅜ inches, a width of 3 ¼ inches and a thickness of 7 mils. More specifically, the master card **10** is formed from a piece of porous tab card stock having capillary passages extending therethrough throughout substantially the entire body thereof. Absorbed in the capillary passages of the master card **10** is a quantity of vaporizable sensitizer, the master card **10** containing about one mg. of sensitizer. As illustrated, the master card **10** is further provided with a standard punched card grid on the front face thereof, the grid being generally designated by the numeral **20** and comprising a series of rows of numbers, 80 columns of such numbers being illustrated in FIG. **2**. The grid **20** defines an address area **30** on the card **10** to receive therein an address **40** printed in infrared or heat absorbing material, for example, in ink containing a high content of carbon black.

The sensitizer absorbed in the master card **10** must have certain specific properties to be useful in the apparatus and method of the present invention. A preferred sensitizer for use in the master card **10** is sold under the designation "Magie Oil **590**," and is a mixture of branched aliphatic hydrocarbons each containing at least 10 carbon atoms with branches thereon containing up to as many as four carbon atoms. The oil further has an API gravity of 36, a specific gravity of 0.845, a density of 6.9 pounds per gallon, a flash point of 335° F., a fire point of 360° F., a viscosity at 100° F. of 47, a K.B. number of 22.5, a straw color, an aniline point of 187, an initial boiling point of 590° F. and an end boiling point of 635° F. A master card **10** having the dimensions set forth above may contain as little as 0.1 mg. of oil and up to as much as 4 grams of oil, care being taken that not too much oil be present so that the master card **10** will not feel oily to the touch.

Another preferred sensitizer for use in the master card **10** are certain alkyl esters such as dimethyl sebacate and diethyl sebacate. Yet other preferred sensitizers for use in the master card **10** are aromatic esters including dimethyl phthalate and diethyl phthalate. A

master card **10** having the dimensions set forth above may contain as little as 0.1 mg. of the ester and up to as many as 4 grams of the ester.

The master card **10** has many important advantages due to the character of the tab card stock of which it is made and due to the character and quantity of sensitizer impregnated therein. More specifically, the master card **10** can have the address **40** printed thereon, or type thereon, or written thereon, or applied thereto in any other known manner, all without interference from the sensitizer content thereof. Furthermore, the address **40** will not bleed, smudge or block, (i.e., transfer from the face of one card to the rear of another in a stack of the cards) due to the presence of sensitizer therein. Furthermore, the sensitizer does not increase the friction between cards or the adhesiveness between cards, whereby the master cards **10** may be handled manually and in machines in the usual manner required. Furthermore, the sensitizer is non-toxic, odorless, and otherwise not obnoxious in use. Furthermore, the sensitizer does not cause the card stock to become soft and mushy. Finally, the sensitizer has low volatility at ambient conditions but has a substantially partial pressure in the temperature range from about 100° to about 160° C., whereby heating thereof will cause a vapor transfer from the master card **10** to an adjacent surface. Up to 500 such vapor transfers or impressions can be made from a single master card **10** without replenishing the sensitizer therein, and as many as eight vapor transfers or impressions may be made in a single working day due to the fact that the sensitizer lost in transfer is replaced due to the movement of sensitizer through the capillary passages in the master card **10** from areas adjacent to those from which the sensitizer is lost by vaporization.

There is illustrated in FIG. 1 of the drawings a schematic representation of the apparatus and method of forming the master card **10**, the apparatus being generally designated by the numeral **100**. The apparatus **100** includes a source of porous tab card stock in the form of a roll **101** thereof which may be, for example, 24 inches in diameter and is supported on an axle **102**. A first length **105** of the tab card stock from the roll **101** passes over a guide pulley **120** and into a tank **130** in which is disposed an impregnating solution **131** that will be described more fully hereinafter. Another guide roller **132** is provided in the tank **130** so that another section **106** of the tab card stock is disposed between the pulleys **120** and **132**, a portion of the section **106** being disposed in the impregnating composition **131**. From the guide roller **132** another section **107** of the tab card stock extends upwardly to a pair of cooperating pinch or nip rolls **121** and **122** which tend to squeeze excess impregnating composition from the tab card stock, the excess composition falling downwardly onto an inclined surface **133** that drains back into the tank **130**. After leaving the pinch rolls **121–122**, the tab card stock passes in a length **108** to a guide roller **123** and along a length **109** to a guide roller **124** and along a length **110** to a guide roller **125** from which a length **111** extends to a guide roller **126**. The several lengths **108**, **109** and **110** of the impregnated tab card stock are exposed to ambient pressure and temperature conditions, whereby the solvent forming a part of the solution **131** will be evaporated therefrom leaving in the tab card stock only the sensitizer, all as explained above. The length **111** of the tab card stock with the sensitizer impregnated therein has the grid **20** printed thereon by a printing mechanism **140** that includes movable type **141** and a backup plate or bed **142**, whereby there is printed on the tab card stock the grid **20**.

After passing the printing mechanism **140**, the tab card stock passes to a section **112** where a cutting mechanism **150** is provided that serves to cut the essentially continuous tab card stock strip into individual master cards **10**, the cutting mechanism **150** including the usual die **151** and a backup plate or bed **152**. The cut and finished master cards **10** are fed to a stack thereof generally designated **160**.

The impregnating solution **131** is preferably a mixture of the sensitizer that is to be impregnated into the master card **10** and a suitable volatile solvent therefor, the preferred solvent being hexane when the sensitizer is "Magie Oil **590**." The hexane not only is a solvent for the sensitizer but also serves as a penetrating agent carrying the sensitizer into the tab card stock and also lowering the viscosity of the sensitizer to aid in the impregnation. In a preferred example, the sensitizer is "Magie Oil 590" **and comprises** 20 percent by weight of the impregnating solution **131** and the hexane comprises 80 percent by weight of the impregnating solution **131**. It has been found that the impregnating solution may contain as little as 5 percent by weight of the sensitizer and up to as much as 50 percent by weight of the sensitizer, the remainder being hexane. In general it is impractical to use less than 5 percent by weight of sensitizer in the impregnating solution **131**, and on the other hand, if more than about 50 percent by weight of the impregnating solution is sensitizer, then the resultant master card **10** is objectionably oily to the touch. Other suitable solvents may be utilized in place of the hexane, examples being acetone, pentane, heptane, and chlorinated solvents such as dichloroethane and trichloroethane.

In the impregnating method of FIG. 1, it is preferred that the speed of the web of tab card stock be about 10 feet per second, and that about six inches of the tab card stock be immersed at any time in the impregnating solution **131**, thereby to give a residence time of one-twentieth second in the impregnating solution **131**. Such a residence time is adequate to provide saturation of the tab card stock. It will be appreciated that other methods of applying the impregnating solution **131** such as by spraying and the like may be substituted in place of the dip bath of FIG. 1. The vapor pressure of the solvent in the impregnating solution **131** must have a sufficiently high vapor pressure so that all of the solvent is evaporated in approximately 1 second, whereby the printing mechanism **140** may be disposed as short a distance as 10 feet from the tank **130**, and still permit all of the solvent to be evaporated from the tab card stock before reaching the printing mechanism **140**.

There is then applied to the master card **10** in the address area **30** the address **40** in an infrared absorbing material. The address **40** may be applied by typing, by printing, by addressograph methods, by handwriting, or by any other suitable method, so long as the address **40** is in a heat or infrared absorbing material.

In accordance with the addressing system of the present invention, the address on a master card **10** is reproduced on a master tape by distilling a portion of the sensitizer from the master card **10** in areas corresponding to the infrared absorbing indicia in the address **40** thereon onto one surface of the master tape. Thereafter the latent image in the form of a sensitizer film on the master tape is developed by passing the master tape through a toner box where toner is picked up by the sensitizer film to reproduce the address in the toner on the master tape. The apparatus and method of transferring addresses from a group of master cards onto a master tape are illustrated in FIGS. **3** to **6**, the apparatus being generally designated in FIG. **3** by the numeral **200**. A roll **201** of master tape **210** is mounted on a support axle **202** in a position to feed a length of the master tape **210** around a first guide roller **203** and a second guide roller **204**, a reciprocating type feed mechanism **220** being provided having a finger **221** engageable in one of a series of openings **211** provided in the master tape **210** intermediate the longitudinal edges thereof and spaced the entire length thereof, the feed mechanism **221** serving to feed the master tape **210** stepwise in fixed increments from left to right as viewed in FIG. **3** between the guide rollers **203** and **204**. There also is provided as a part of the apparatus **200**, a feed mechanism **230** for a stack of master cards including a magazine **231** to hold a stack of the master cards, a chute **232** leading from the magazine **231** onto a pair of spaced apart conveyer belts **233** and **234** that are supported by a plurality of guide rollers **235** and a drive roller **236** connected to a source **237** of motive power for the conveyer belts **233** and **234**. As illustrated in FIG. **4**, the conveyer belts **233** and **234** are spaced apart and support a master card **10** adjacent to the ends thereof thereby to leave unobstructed the address area **30** carrying the address **40** thereon, the master tape **210** overlying the address area **30** and being disposed thereagainst, the side of the master card **10** carrying the address **40** therein being disposed upwardly.

The apparatus **200** also includes a printing station **240** at which is disposed a source of infrared radiation in the form of a powerful lamp **241** having its power supply **242** associated therewith. The infrared lamp **241** will preferentially heat the heat absorbing ink forming address **40** in the area **30** and cause a portion of the sensitizer in the master card **10** to be vaporized in the area of the address **40** from the upper surface of the master card **10** onto the adjacent undersurface of the master tape **210** where the oil is condensed in a film having areas shaped corresponding to the address **40** in the area **30** on the master card **10**.

After exposure to the lamp **241** at the printing station **240**, the master card **10** eventually is deposited in a receptacle **238** therefor and the master tape **210** with the latent image of the address in the form of a sensitizer film thereon is fed to a toner box **250** containing a suitable toner **251**. More specifically, the master tape **210** is fed from the printing station **240** to and over the guide roller **204** and around a guide roller **252** in the toner box **250**, thereby to expose the sensitizer film on the underside of the master tape **210** to the toner **251** in the toner box **250**. The master tape **210** with the granular toner thereon in the areas corresponding to the address on a master card **10** is then fed past a second source of infrared radiation in the form of a lamp **253** having a power supply **254**, the lamp **253** providing intense infrared radiation at least partially to fuse the toner on the master tape **210**, thereby to provide a continuous master tape **210** having on predetermined portions thereof bodies of partially fused toner in the areas corresponding to the indicia on a group of master cards **10**, two such predetermined portions **212** and **214** of the master tape **210** having been illustrated in FIG. **5** of the drawings carrying two addresses from two of the master cards **10** thereon. More specifically, the predetermined portion of **212** carries bodies **215** of toner and predetermined portion **214** carries bodies **217** of partially fused toner, the bodies **215** and **217** of toner defining addresses corresponding to the addresses on two of the master cards **10**.

In order properly to operate the apparatus **200**, the master tape **210** must have certain predetermined characteristics. In one preferred form of the invention, the master tape **210** is a glassine base paper strip (i.e., a strip of high density paper fibers treated with concentrated sodium hydroxide to render the strip transparent) coated on at least one side thereof with a Werner-type chromium complex such as that sold under the trademark "Quilon," such a paper strip being offered by the Rhinelander Paper Co. under the trademark "$Q_2S$" (coated on both sides with the Werner-type chromium complex). A master tape formed of these materials is non-porous and oleophobic, is transparent to infrared radiation, is non-sticky to the touch, possesses good resin release characteristics, is dry to the toner, and is non-sticky to an envelope or other mailing piece to which the addresses thereon are to be transferred in a subsequent operation to be described hereinafter.

In place of the glassine base strip described above, there may be utilized in the present invention a parchment paper such as that sold by Patterson Parchment Company under the trademark "TS–35" carrying on each side thereof a coating of a Werner-type chromium complex such as that sold under the trademark "Quilon."

The toner **251** of the present invention preferably comprises a vehicle body, modifiers and pigments, the following being an example of a preferred formulation thereof:

| Ingredients | Parts By Weight |
|---|---|
| Wood rosin | 60 |
| Polymerized rosin | 20 |
| Polyamide resin | 4 |
| Hydrocarbon resin | 2 |
| Furnace carbon black | 10 |
| Channel carbon black | 4 |
| Dispersant, lecithin | 0.5 |
| Total: | 100.5 |

The above ingredients were thoroughly mixed and thereafter placed in a jacketed mixture having a sigma mixture blades therein and heated to a temperature in the range from about 250° to about 275° F. by passing steam through the jacket of the mixture, the steam entering at a temperature of about 280° and exiting at a temperature of about 270° F. The fused and molten

mixture was stirred until the consistency was that of molasses, a 5 gallon batch requiring about 35 minutes of mixing. The molten mixture was then poured onto a ceramic slab and cooled to a solid. The cooled solid was ground and pulverized in a hammer mill until the toner particles had sizes in the range from about 5 microns to about 50 microns. Thereafter the particles were screened to be sure that the particles utilized in the toner were in the range from about 5 microns to about 50 microns. Particles smaller than about 5 microns are too small and cause dusting, whereas particles larger than about 50 microns provide poor toning or imaging.

In a specific example of the toner **251**, the wood rosin is that sold under the designation "WW Wood Rosin" by the Hercules Powder Company, the polymerized rosin is that sold under the trademark "-Poly-Pale" by the Hercules Powder Company, the polyamide resin is that sold under the trademark "Versamid 930", the hydrocarbon resin is that sold under the trademark "Amoco resin 18–210", the furnace carbon black is that sold under the trademark "Statex F–12,"a the channel carbon black is that sold under the trademark "Carbolac 2" and the dispersant is that sold under the trademark "Despergan." Further details of the toner **251** composition and ratios of the ingredients thereof and methods of making the toner **251** may be found in the above-mentioned parent application Ser. No. 643,718.

Considering now further the method of utilizing the apparatus **200** illustrated in FIGS. **3** and **4** of the drawings, the master cards **10** are successively fed one by one from the magazine **231** onto the chute **232** and from there onto the conveying belts **233–234**. At the same time, the master tape **210** is being fed from the roll **201** thereof downwardly and around the guide roller **203**. Then the lower face thereof is pressed against the master cards **10**, movement of the master tape **210** being under the control of the tape feed mechanism **220** and the finger **221** engaging in the openings **211** in the master tape **210**. The feed mechanism **220** and the drive **237** for conveyer belts **233–234** operate stepwise to stop the master tape **210** with the predetermined portion thereof disposed against and covering the address **40** on a master card **10** disposed therebeneath at the printing station **240** and in alignment with the infrared lamp **241**. More specifically, the portion of the master tape **210** disposed between two adjacent openings **211** is in registry with the address **40** on the master card **10** disposed below the infrared lamp **241** as illustrated in FIG. **4**. Energization of the lamp **241** vaporizes a portion of the sensitizer in the master card **10** onto the adjacent surface of the master tape **240**. The infrared radiation from the lamp **241** is preferentially absorbed by the pigments in the address **40**, whereby the sensitizer is vaporized from those areas of the card **10** covered by the address **40**. The sensitizer as it is vaporized from the card **10** is immediately condensed and cooled on the adjacent surface of the master tape **210** to provide thereon sensitizer film that reproduces the address **40** to form in effect a latent image of the address thereon.

The above described process is repeated rapidly at the printing station **240**, after which the master tape **210**, with the latent image of an address is sensitizer disposed between each pair of adjacent openings **211** therein, is fed to the toner box **250** where the loose toner is picked up by the sensitizer films on the master tape **211**, thus to provide developed images in particles of toner of the addresses on the master tape **210**. In order to render the thus developed toner images more permanent, they are exposed to the radiation from the lamp **253** which heats the toner to a temperature above the fusion point thereof, thus to provide bodies of partially fused toner defining the addresses on the series of master cards **10** to which the master tape **210** was exposed.

At the same time the exposed master cards **10** are delivered by the conveyer belts **233–234** to the receptacle **238** therefor. The sensitizer in the master cards **10** adjacent to the address areas **40** therein quickly migrates by capillary and osmotic action into the address areas **40** to replenish the sensitizer therein, thereby to render it possible shortly thereafter again to print a latent image in sensitizer of the address **40** on another master tape **210**. It has been found that as many as eight or more impressions can be taken from a master card **10** in a normal working day, and up to a total of 500 or more may be made from a single master card **10** before it is necessary to replenish the sensitizer therein.

There are illustrated in FIGS. **5** and **6** of the drawings the details of the structure of the master tape **210** carrying the addresses thereon in bodies of partially fused toner. Referring first to FIG. **5**, there is shown a section of the master tape **210** with the longitudinal axis thereof arranged vertically with three of the openings **211** therein illustrated defining therebetween two predetermined address carrying portions **212** and **214**, respectively. Arranged in the predetermined portion **212** is an address **215** and arranged in the predetermined portion **214** is an address **217**, the addresses **215** and **217** being backward reading i.e., reading from right to left. As is illustrated in FIG. **6**, the addresses **215** and **217** comprise bodies of fused toner adhered to the underlying surface of the master tape **210**. The partially fused toner bodies forming the addresses **215** and **217** have a certain amount of elasticity and resilience whereby the master tape **210** may be rewound into roll form as at **260** in FIG. **3**, the roll **260** being supported upon an axle **261**. The roll **260** of the master tape **210** with the several addresses **215**, **217**, **219**, etc. thereon can be stored substantially indefinitely and further can be transferred as an article of commerce at such time as the addresses thereon are required for mailing or the like.

There is illustrated in FIG. **7** of the drawings a diagrammatic representation of an apparatus **300** and a method for transferring the addresses **215**, **217**, **219**, etc. from the master tape **210** onto a suitable receptor sheet such as a plurality of envelopes **330**. In the apparatus **300**, the roll **260** of master tape **210** is supported upon an axle **301** so that the master tape **210** can be readily fed therefrom and around a guide roller **302** to an addressing station **310** where the addresses on the master tape **210** are transferred onto the envelope **330**. From the addressing station **310**, the master tape **210** is fed around a guide roller **303** and up to a takeup roll **201** of the master tape **210** mounted on an axle **304**.

The envelopes 330 are contained in a magazine 331 and are fed therefrom onto and down a chute 332 onto an envelope feed mechanism 320 including a feed belt 321 supported by a plurality of rollers 322 and a drive roller 323 connected to a suitable stepwise drive mechanism 324. The envelope feed mechanism 320 serves to feed the envelope 330 sequentially to the addressing station 310 at which is positioned a mechanism 311 for pressing a heated member 312 against the rear surface of the master tape 210 positioned above an envelope 330, the envelope 330 and the belt 321 being supported by a backup bed or platen 314. After leaving the addressing station 310, the tape 210 is wound upon the roll 201, the axle 304 being suitably driven by a drive mechanism 305 and the addressed envelopes 330 are delivered to a receptacle 333 therefor.

Considering now more specifically the method of operation of the address transferring apparatus 300, the addresses such as the addresses 215, 217 and 219 on the outer surface of the master tape 210 are carried by the master tape 210 to the addressing station 310, the addresses such as the address 215 being disposed downwardly. The envelope feed mechanism 320 operates sequentially to feed envelopes 330 received from the magazine 331 sequentially one by one to the addressing station 310 to place the envelope below a predetermined one of the addresses, such as the address 215, on the master tape 210. The master tape 210 and the envelope 330 are both stopped at the addressing station 310 after which the mechanism 311 is operated to press the heated member 312 against the rear of the master tape 210 to heat the partially fused bodies of toner forming the address 215 above the fusion point thereof, for example to a temperature in the range of about 225° to about 250° F., and to press the bodies of toner forming the address 215 against the adjacent surface of the envelope 330. In this operation, the bodies of partially fused toner forming the address 215 are substantially completely transferred from the surface of the master tape 210 onto the adjacent surface of the envelope 330, and also the bodies of toner forming the address 215 are fully fused to provide on the envelope 330 bodies of fully fused toner arranged to provide the address 40 on the master card 10 that was utilized to provide the address 215 on the master tape 210.

The transfer of the toner from the master tape 210 and the envelope 330 to provide an address on the envelope 330 is facilitated by the fact that there is substantially no adherence between the toner bodies and the surface of the master tape 210, it being pointed out that the surface of the master tape 210 is non-porous, oleophobic, and possesses good release characteristics. The surface of the envelope 330 on the other hand has a good affinity for the bodies of toner forming the address, thereby materially to facilitate the transfer of the toner bodies thereto. As a result, there is provided on the envelope 330 a forward reading, i.e., left to right reading, reproduction in toner of the address 40 on the original corresponding master card 10. As the addresses on the master tape 210 are transferred onto the envelopes 330 sequentially, a group of envelopes is provided having addresses thereon corresponding to the addresses on the group of master cards 10 that were in the magazine 231.

It will be appreciated that other suitable apparatus may be utilized in place of the apparatus 300 illustrated in FIG. 7 to transfer the addresses on the master tape 210 onto the envelope 330. For example, a machine sold under the trademark "Cheshire Model 514" is particularly useful for this purpose. In fact any suitable machine that will supply a heated member or platen that will heat the bodies of toner to a temperature above the fusion point thereof and apply a pressure thereto will be suitable for this purpose.

From the above it will be seen that there has been provided an improved addressing system incorporating therein improved apparatus and methods which fulfill all of the objects and advantages set forth above. It will be understood that the information on the master cards 10 need not be addresses but may be any other form of information arranged in indicia formed of infrared absorption material, wherein it is desired to duplicate those indicia in a sequential manner on receptor sheets such as the envelopes 330 described above.

While there have been described what are at present considered to be the preferred embodiments of the invention, it will be understood that various modifications may be made therein, and it is intended to cover in the appended claims all such modifications as fall within the true spirit and scope of the invention.

What is claimed is:

1. An apparatus for transferring indicia from a group of master cards onto a master tape, wherein each master card has thereon indicia of infrared absorbing material and vaporizable material in the area of the indicia, and wherein the master tape has a non-porous oleophobic surface having resin release characteristics and is transparent to infrared radiation, said apparatus comprising a printing station having a first source of infrared radiation thereat, a first feed mechanism for feeding the master cards sequentially to said printing station to position a master card with the indicia thereon in position to be exposed to said first source of infrared radiation, a second feed mechanism for feeding the master tape to said printing station to position a predetermined portion of the master tape with one surface thereof disposed immediately adjacent to the indicia on a master car positioned at said printing station, means for operating said first source of infrared radiation after feeding a master card and a predetermined portion of the master tape to said printing station to vaporize from the master card a portion of the vaporizable material from areas corresponding to the indicia thereon onto the one surface of the predetermined portion of the master tape to provide on the master tape vaporizable material arranged in areas corresponding to the indicia, and means for applying a toner to the one surface of the master tape to adhere toner to the vaporizable material thereon in areas corresponding to the indicia, thereby to provide a continuous master tape having on the predetermined portions thereof bodies of toner in areas corresponding to the indicia on the group of master cards.

2. The apparatus set forth in claim 1, and further comprising a third feed mechanism for feeding receptor sheets sequentially to position a receptor sheet against the bodies of toner on the master tape corresponding to the indicia on a master card, and means for applying heat and pressure to the master tape and the receptor sheet to transfer the bodies of toner to the

receptor sheet and fully to fuse the toner thereby to provide on the receptor sheet bodies of fully fused toner in an area corresponding to the indicia on a master card.

3. The apparatus set forth in claim 2, wherein said means for applying heat and pressure to the master tape and the receptor sheet applies a pressure at a temperature above about 225° F.

4. An apparatus for transferring indicia from a group of master cards onto a master tape, wherein each master card has thereon indicia of infrared absorbing material and vaporizable material in the area of the indicia,

and wherein the master tape has a non-porous oleophobic surface having resin release characteristics and is transparent to infrared radiation, said apparatus comprising a printing station having a first source of infrared radiation thereat, a first feed mechanism for feeding the master cards sequentially to said printing station to position a master card with the indicia thereon in position to be exposed to said first source of infrared radiation, a second feed mechanism for feeding the master tape to said printing station to position a predetermined portion of the master tape with one surface thereof disposed immediately adjacent to the indicia on a master card positioned at said printing station, means for operating said first source of infrared radiation after feeding of a master card and a predetermined portion of the master tape to said printing station to vaporize from the master card a portion of the vaporizable material from areas corresponding to the indicia thereon onto the one surface of the predetermined portion of the master tape to provide on the master tape vaporizable material arranged in areas corresponding to the indicia, means for applying a toner to the one surface of the master tape thereby to adhere toner to the vaporizable material thereon in areas corresponding to the indicia, and a second source of infrared radiation for at least partially fusing the toner on the master tape, thereby to provide a continuous master tape having on the predetermined portions thereof bodies of partially fused toner in areas corresponding to the indicia on the group of master cards.

5. The apparatus set forth in claim 4, wherein said first feed mechanism stops the master card at said printing station and said second feed mechanism stops said master tape at said printing station, the master card and the master tape at the printing station being stationary during the operation of said first source of infrared radiation.

6. The apparatus set forth in claim 4, wherein the side of the master card carrying the indicia is in contact with the adjacent one surface of the master tape during the operation of said first source of infrared radiation.

7. The apparatus set forth in claim 4, and further comprising a third feed mechanism for feeding receptor sheets sequentially to position a receptor sheet against the bodies of partially fused toner on the master tape corresponding to the indicia on a master card, and means for applying heat and pressure to the master tape and the receptor sheet to transfer said bodies of partially fused toner to the receptor sheet and fully to fuse said toner thereby to provide on the receptor sheet bodies of fully fused toner in an area corresponding to the indicia on a master card.

8. An apparatus for transferring addresses from a group of master cards onto a master tape, wherein each master card has thereon an address in infrared absorbing material and vaporizable sensitizer in the area of the address, and wherein the master tape has a non-porous oleophobic surface having resin release characteristics and is transparent to infrared radiation, said apparatus comprising a printing station having a first source of infrared radiation thereat, a first feed mechanism for feeding the master cards sequentially to said printing station to position a master card with the address thereon in position to be exposed to said first source of infrared radiation, a second feed mechanism for feeding the master tape to said printing station to position a predetermined portion of the master tape with one surface thereof disposed immediately adjacent to the address on a master card positioned at said printing station, means for operating said first source of infrared radiation after feeding of a master card and a predetermined portion of the master tape to said printing station to vaporize from the master card a portion of the vaporizable sensitizer from areas corresponding to the address thereon onto the one surface of the predetermined portion of the master tape to provide on the master tape a film of sensitizer arranged in areas corresponding to the address, means for applying a toner to the one surface of the master tape thereby to adhere toner to the sensitizer thereon in areas corresponding to the address, and a second source of infrared radiation for at least partially fusing the toner on the master tape, thereby to provide a continuous master tape having on predetermined portions thereof bodies of partially fused toner in areas corresponding to the addresses on the group of master cards.

9. The apparatus set forth in claim 8, and further comprising a third feed mechanism for feeding receptor sheets sequentially to position a receptor sheet against the bodies of partially fused toner on the master tape corresponding to the address on a master card, and means for applying heat and pressure to the master tape and the receptor sheet to transfer the bodies of partially fused toner to the receptor sheet and fully to fuse the toner thereby to provide on the receptor sheet bodies of fully fused toner in an area corresponding to the address on a master card.

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