

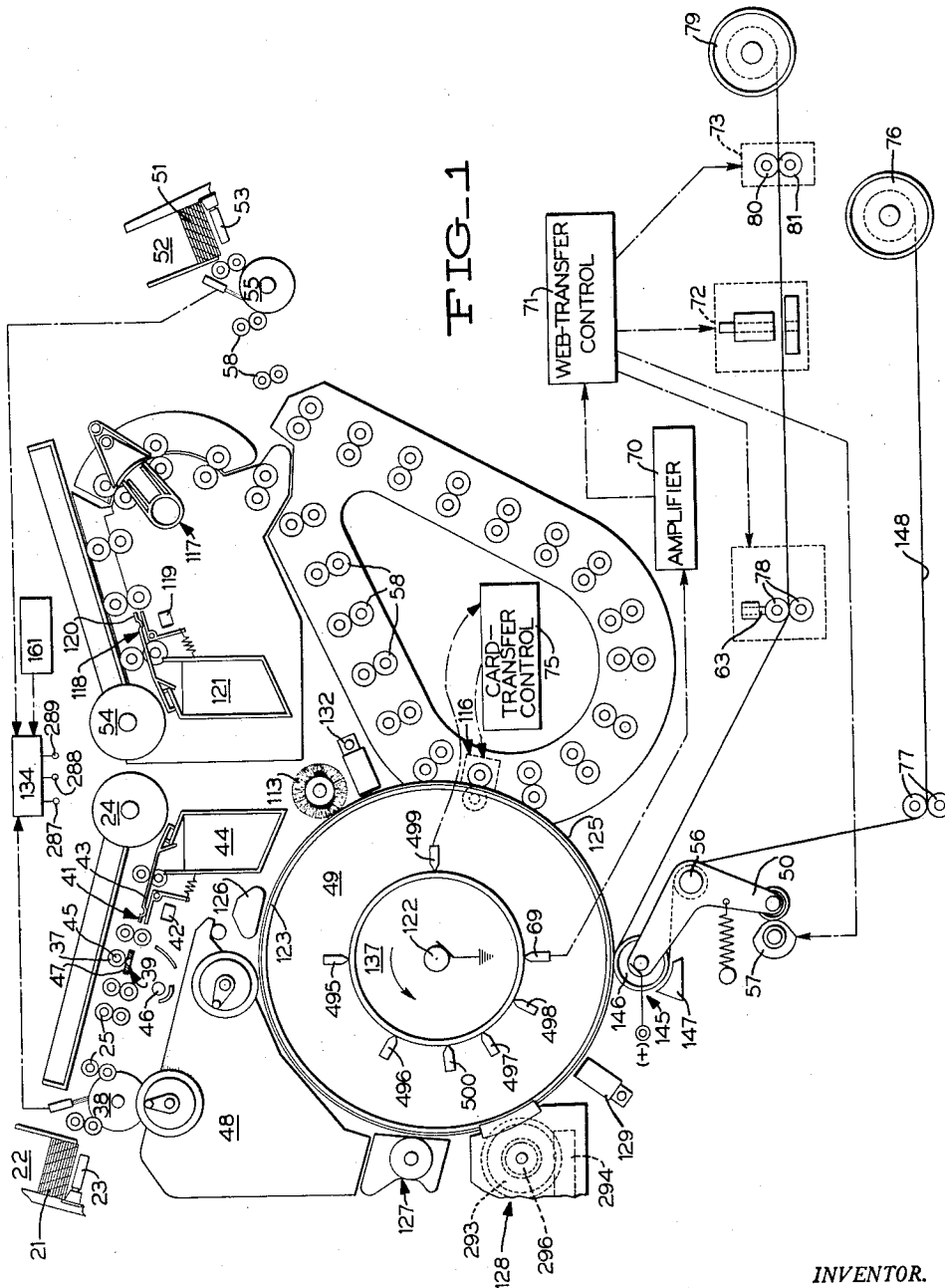
Dec. 29, 1959

D. J. OLDENBOOM
ELECTROSTATIC PRINTER

2,918,853

Filed Aug. 31, 1956

5 Sheets-Sheet 1



INVENTOR.
DERK J. OLDENBOOM

BY

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ATTORNEY

Dec. 29, 1959

D. J. OLDENBOOM
ELECTROSTATIC PRINTER

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5 Sheets-Sheet 2

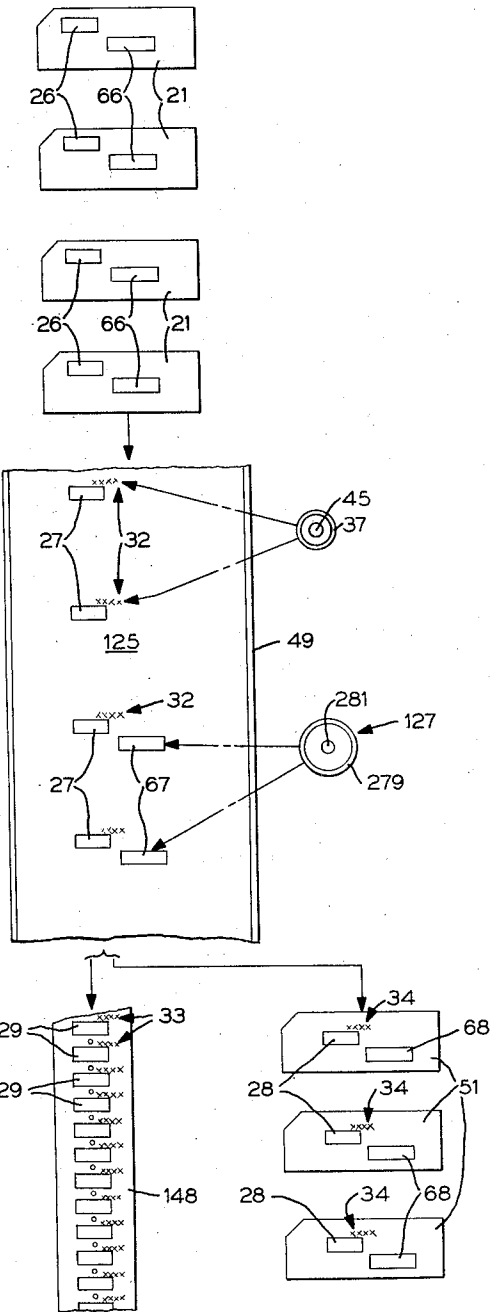


FIG. 2

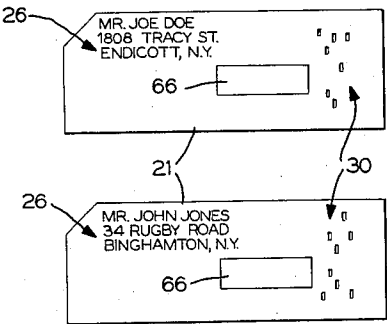


FIG. 3

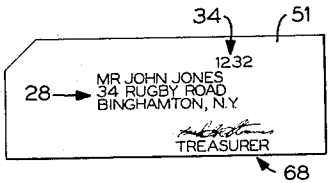


FIG. 4

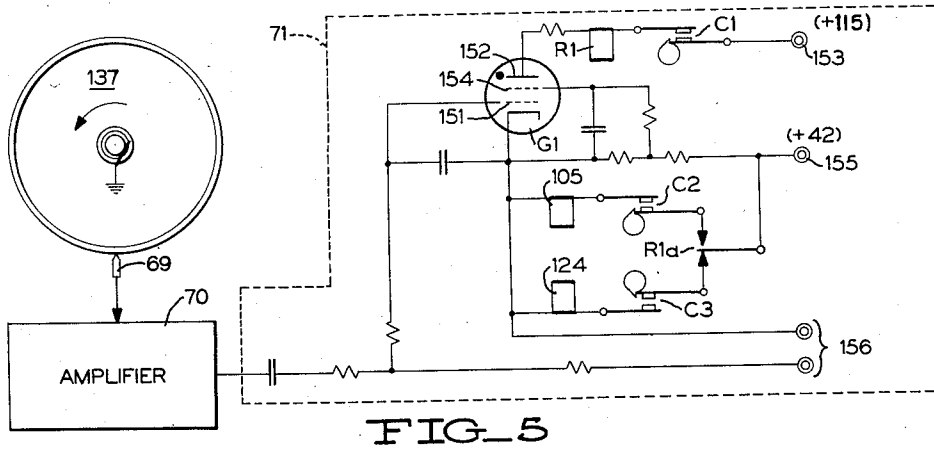
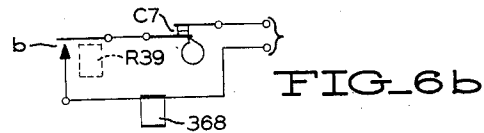
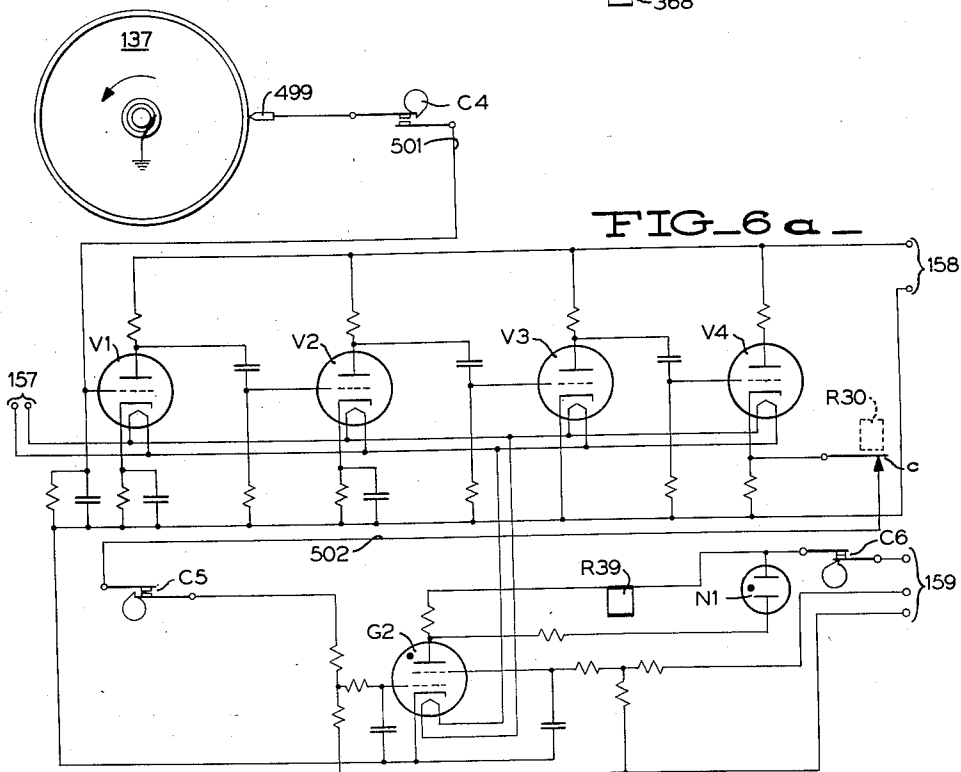
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5 Sheets-Sheet 3



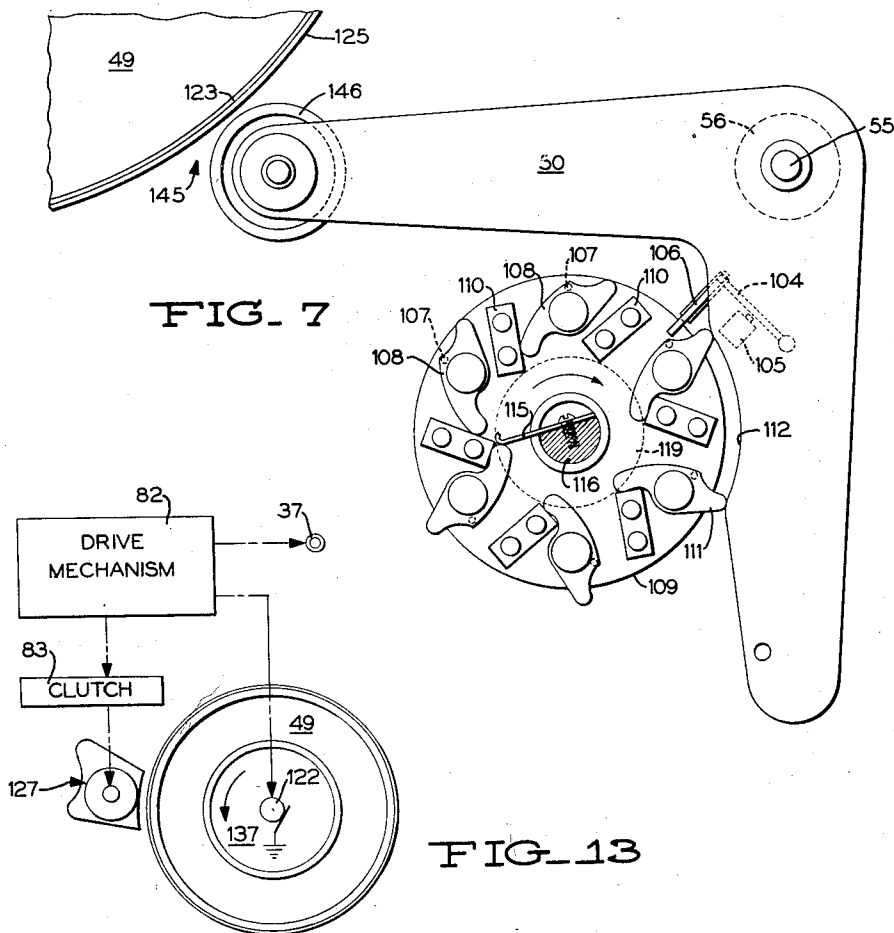
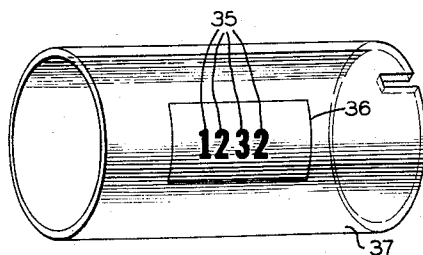
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2,918,853

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5 Sheets-Sheet 4



Dec. 29, 1959

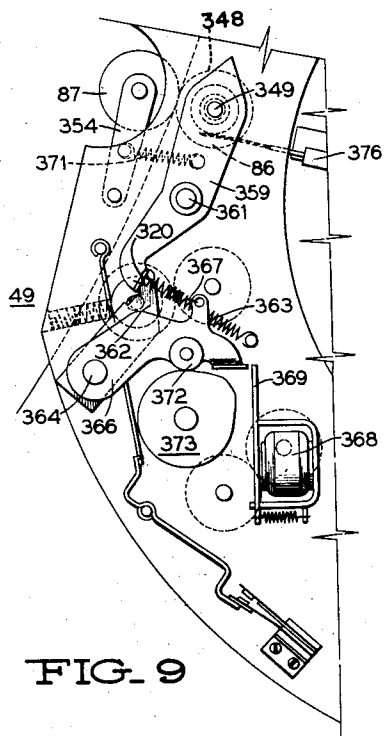
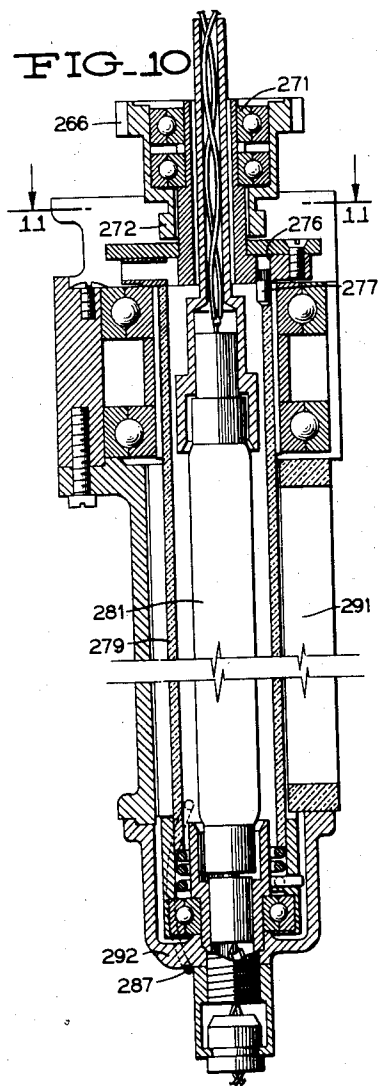
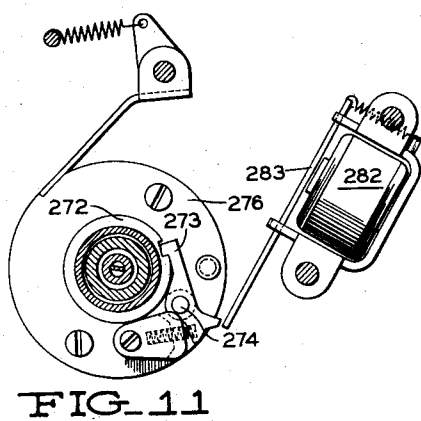
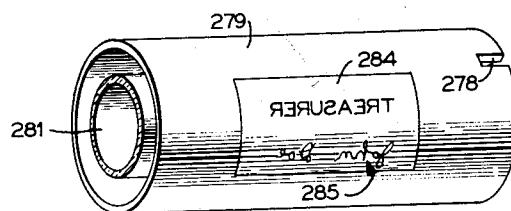
D. J. OLDENBOOM

2,918,853

ELECTROSTATIC PRINTER

Filed Aug. 31, 1956

5 Sheets-Sheet 5



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2,918,853

ELECTROSTATIC PRINTER

Derk J. Oldenboom, Johnson City, N.Y., assignor to International Business Machines Corporation, New York, N.Y., a corporation of New York

Application August 31, 1956, Serial No. 607,491

11 Claims. (Cl. 95—1.7)

This invention relates to an electrophotographic printing machine, and has for its broad object the provision of a multipurpose electrophotographic printer which is capable of producing imprints of original design or as facsimiles of existing design. For purposes of this specification, it is intended that a design include any visibly discernible record, drawing, arrangement of legible characters, symbols, and the like.

It will be recognized by persons familiar with this phase of the graphic arts that the preferred embodiment of the invention described herein is an electrophotographic printing machine commonly referred to as a xerographic printer. Furthermore, it will be recognized such persons that xerography is a term applied to a printing process performed with such a printer in which latent electrostatic images are rendered visible by an electrically charged pigmented powder often referred to as electroscopic toner, whereafter the resulting toner images are transferred and then permanently affixed to a suitable print receiving material. This process will, of course, afford copy that has an imprint thereon which corresponds to the design configuration of the latent electrostatic images.

It will also be recognized by persons familiar with this phase of the graphic arts that the xerographic printers available heretofore have for the most part been employed to produce a facsimile of optically visible source information. It is to be noted, however, that the xerographic printer which is disclosed and claimed in the copending U.S. patent application, Serial No. 477,556, filed W. D. Bolton on December 24, 1954, is capable of producing so-called original documents. For purposes of this specification, an original document is printed copy with an original design imprinted thereon, and is produced xerographically when different bits of information which are each obtained from a respective one of a plurality of separate information sources, are so related one with another on the surface of a xerographic plate that a single original composite latent electrostatic image which in its entirety differs from any of the individual bits of information, is formed thereon.

As the description advances it will become clear that the preferred embodiment of the present invention pertains to a xerographic printing machine capable of producing an imprint of original design. The said design may include a predetermined arrangement of a facsimile of information appearing on source information records, such as the well-known IBM record cards for example, as well as a facsimile of information from still another source thereof. Furthermore, this original design can be produced selectively on either print receiving records, such as IBM record cards for example, or a print receiving web whereon the so selected original design imprints could be arranged successively on a continuous strip. The afore-mentioned source information records (to be termed primary cards hereinafter) which may also have machine control data recorded thereon, are fed past a machine control data sensing station and a source in-

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formation optical scanning station. Print or image-information receiving records (to be termed secondary cards hereinafter) which too may have machine control data recorded thereon are fed past another machine control data sensing station, an electroscopic toner image card-transfer station, and a toner image card-fixing station. Thus, in a manner similar to that already described in detail in the copending U.S. patent application, Serial No. 556,176, filed by M. J. Kelly on December 29, 1955, the primary and secondary card machine control data that are recorded on their respective cards and caused to be read at their respective sensing stations, can be used to govern various printing machine operations. Furthermore, for example, by comparing the recorded primary and secondary card control data so as to obtain the relative magnitude of one with respect to the other, the present printer can be controlled to effect the transfer of an original design or a facsimile of primary card source information onto only certain secondary cards which are related to the primary cards by the aforesaid primary and secondary machine control data. In addition thereto, the xerographic printer described herein can be governed to cause an original design and/or a facsimile of primary card source information which is not transferred onto an aforesaid related secondary card to be transferred onto the aforementioned web.

Hence, another object of this invention is to provide an improved record card controlled xerographic printer capable of effecting a selective printing operation with respect to one of a plurality of print receiving materials.

In line with the foregoing, another object of this invention is to provide an improved record card controlled xerographic printer which is capable of effecting a print operation selectively on either a record card or a web.

Still another object of this invention is to provide an improved record card controlled xerographic printer which is capable of producing imprints of original design or as facsimiles of existing design on individual records and/or a web of print receiving material.

Another object of this invention is to provide a more flexible xerographic printer than known heretofore; that is, one which is extremely versatile because it affords a greater number of different operations than previous xerographic printers.

As the description advances, it will also become clear that the optical image of the source information carried by each primary card is stored as a conventional latent electrostatic image on the surface of a constantly rotating cylindrical xerographic plate or drum having a photoconductive insulating layer thereon. However, when copy having an imprint of original design thereon is to be produced, an image of information from a source other than the primary card such as an optical image producing mask, for example, is also projected and then stored as a latent electrostatic image, on the surface of the constantly rotating xerographic drum. As indicated previously, these images must be arranged on the surface of the xerographic drum in such a related predetermined manner as to produce a single original design. Thus, a composite latent electrostatic image indicative of the original design as defined by the plurality of related latent electrostatic images, is produced.

Accordingly, still another object of this invention is to provide an improved record card controlled xerographic printer for preparing imprints of original design that bear information initially obtained from a plurality of separate information sources.

Other objects of the invention will be pointed out in the following description and claims and illustrated in the accompanying drawings, which disclose, by way of examples, the principle of the invention and the best mode, which has been contemplated, of applying that principle.

In the drawings:

Fig. 1 is a somewhat diagrammatic view of the record card controlled card-to-web and/or card-to-card printer.

Fig. 2 is a flow diagram depicting generally the steps required in the card-to-web and/or card-to-card original document producing operation.

Fig. 3 is a view of source information primary record cards capable of use for the operation depicted by the flow diagram shown in Fig. 2.

Fig. 4 is a view of an image-receiving secondary card, i.e., an original document, as produced by the operation depicted by the flow diagram shown in Fig. 2.

Fig. 5 is a wiring diagram of the control apparatus for governing the web printing operation.

Figs. 6a—6b, taken together, are a wiring diagram of the control apparatus for governing the card printing operation.

Fig. 7 is a view of the toner image web-transfer roller camming mechanism.

Fig. 8 is a schematic view of the source information cylinder within the primary card source information scanning station.

Fig. 9 depicts the toner image card-transfer roller operating mechanism.

Fig. 10 is a cross-sectional view of a source information apparatus outside of the afore-mentioned scanning station.

Fig. 11 is a view taken along line 11—11 of Fig. 10.

Fig. 12 is a schematic view of the source information cylinder shown in Fig. 10.

Fig. 13 is a diagrammatic view of the drum and the source information cylinder drive mechanism.

General machine description

Primary record card feed unit.—Referring to Fig. 1, primary record cards 21 to be operated on are stacked in a hopper 22 and are fed therefrom, one by one, each primary card feed cycle by a conventional card picker mechanism 23 toward a pair of card stackers 24 and 44. Successive pairs of feed rollers 25 cause each primary card 21 to be advanced during successive machine card feed cycles past a punched-hole indicia brush reading station 33, an optical scanning station 39, and a primary card distributing station 41. So long as the distributing station control magnet 42 is de-energized, primary cards will be advanced from hopper 22 directly into the drum-type stacker 24. Consequent upon the energization of magnet 42, however, the movable end of a chute blade 43 thereat will be raised above the primary card feed line, to thereby direct primary cards into the drop-type stacker 44.

By directing a band of light rays from a light source projector apparatus 46 upon a scanning slot in member 47, there is effected a conventional light scanning operation of each passing primary card so that the image of the optically visible source information 26 (see also Fig. 3) carried thereon is transferred by the optical projecting apparatus 48 onto the surface of the photoconductive insulating layer 125 of xerographic drum 49.

Secondary record card feed unit.—Secondary record cards 51 to be operated on are stacked in a secondary hopper 52, and are fed, one by one, each secondary card feed cycle out of hopper 52 toward the secondary card stackers 54 and 121. These secondary cards are fed from their hopper by a conventional card picker mechanism 53 to successive pairs of feed rollers 53 which cause each secondary card 51 to be advanced during the succeeding secondary card feed cycles past a punched-hole indicia brush reading station 55, an in-flight card aligner and advancing mechanism (not shown) which is disclosed and claimed in the copending U.S. patent application, Serial No. 584,300, filed by D. J. Oldenboom on May 11, 1956, a toner image card-transfer station 116 which is described in detail in the afore-mentioned copending Kelly application, a toner image card-fixing station 117 which

is disclosed and claimed in the copending U.S. patent application, Serial No. 591,495, filed by R. C. Allen et al. on June 14, 1956, now U.S. Patent 2,807,704, issued September 24, 1957, and a secondary card distributing station 118. As it is with the primary card feed unit, distributing magnet 119 can be controlled to direct secondary cards to either the drum-type stacker 54 when it is de-energized, or into the drop-type stacker 121 when it is energized to raise the movable end of chute blade 120 above the secondary card feed line.

Web operating unit.—The web drive feed rollers 80—81 within drive unit 73 engage web 148 so as to advance the same from reel 76 past rollers 77 and 56, toner image web-transfer roller 146, pressure fixing rollers 78, web perforating mechanism 72, and onto reel 79. Both the web drive mechanism 73 and the web punch mechanism 72 are connected to the subject printer main drive mechanism 82 (Fig. 13) by suitable means (not shown) through a conventional electromagnetic clutch whose governing magnet 124 (see also Fig. 5) is a part of the web 148 (Fig. 1) control apparatus 71. As will be brought out in some detail hereinafter, whenever the magnetic drum reading head 69 detects a magnetic spot or bit of recorded information on the surface of magnetic drum 137, the afore-mentioned clutch will be rendered operated so as to disconnect both the web drive mechanism 73 and the punch mechanism 72 from the afore-mentioned printer main drive mechanism. It is to be observed that the principle of operation of the present web operating unit is similar to that for the apparatus shown and described in the copending U.S. patent application, Serial No. 419,392, which was filed by I. M. Hix et al. on March 29, 1954, now Patent No. 2,859,673.

In order that the web is neither torn nor mutilated in any fashion by being pulled through the toner image fixing rollers 78 under high pressure, these rollers are also connected to the printer main drive mechanism via the aforementioned clutch so that rollers 78 are driven in step with the rollers 80—81. The oil pad 63 is provided to remove any excess toner which might cling to the upper roller 78 during the toner image fixing operation.

Xerographic apparatus.—The xerographic drum 49 is mounted on an electrically grounded shaft 122 and is driven in a counterclockwise direction by suitable means shown diagrammatically in Fig. 13 to be connected to the main printer drive mechanism 82. This drum includes an electrically conductive cylinder 123 with a photoconductive insulating layer 125, such as amorphous selenium for example, thereon. Thus, as successive incremental areas of the light sensitive layer 125 are moved past a positive corona charging unit 126 at a rate of speed which is correlated to the lineal speed of feeding primary cards 21 through optical scanning station 39, the said insulating layer 125 is electrically charged positive. After this layer is so charged, a latent electrostatic image may be formed thereon consequent upon the exposure of the said layer 125 to an optical image of the source information carried by a primary card 21. This optical image is projected onto the positively charged surface of layer 125 via the apparatus identified by reference numeral 48 and described in detail in the copending U.S. patent application, Serial No. 584,300, which was filed by D. J. Oldenboom on May 11, 1956. The continued rotation of xerographic drum 49 in a counterclockwise direction will cause the incremental surface areas of photoconductive insulating layer 125, now having a latent electrostatic image thereon which corresponds to the primary card source information, to be moved past another optical image information source 127 to be described in detail hereinafter. For the present, it need only be brought out that the apparatus identified by reference numeral 127 can be operated to produce another latent electrostatic image on the surface of insulating layer 125, which latter image can be so arranged relative to the previously formed image that a composite image

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of original design will result. To restate the preceding, the last-mentioned latent image along with a latent image of the previously-mentioned primary card source information caused to be projected onto electrically charged layer 125 by optical apparatus 48, produces a composite latent electrostatic image which depicts an original design.

Continued rotation of xerographic drum 49 will cause the successively arranged latent electrostatic images 27 (see also Fig. 2), 33 and 67 on layer 125 of xerographic drum 49 to be moved past a brush-type image developing station 128 (Fig. 1) having apparatus therein for visibly defining these latent electrostatic images. This developing apparatus is disclosed and claimed in the copending U.S. patent application, Serial No. 554,515, filed by W. D. Bolton et al. on December 21, 1955, as being comprised of a suitable brush 293 on a rotatable cylinder 296 for carrying electroscopic toner particles by fibers of the brush 293 from a toner reservoir 294 onto the surface of photoconductive layer 125. Further rotation of the xerographic drum will cause the toner images on the surface of layer 125 to be moved out of the developing station 128, past a negative corona unit 129, and into a web-transfer, or web-printing, station 145 that has a shiftable conductive transfer roller 146 thereat. In general, this transfer roller includes an inner metallic conductive portion and an outer portion of yieldable material having an electrical resistance of at least 10^6 ohms per cubic centimeter. The operation of the apparatus included within transfer station 145 which is described in detail in the aforementioned copending Hix et al. application, is such as to effect a transfer of an electroscopic toner image on xerographic drum 49 from the surface thereof onto web 148, whenever transfer roller 146 is shifted radially to engage the surface of xerographic drum 49. Of course, not all of the electroscopic toner images that appear on the surface of xerographic drum 49, are caused to be transferred onto the surface of web 148. Thus, by maintaining the shiftable transfer roller 146 at a position away from the xerographic drum so that a space exists between the surface thereof and the said roller, none of the xerographic drum supported toner images will be transferred. As a result, these toner images will be advanced to a card-transfer, or card-printing, station 116. Since the transfer apparatus is not a part of the present invention per se, and since this transfer apparatus as well as the principle of operation thereof is similar to that which is shown and described in the copending U.S. patent application, Serial No. 419,314, filed on March 29, 1954, by C. J. Fitch, now U.S. Patent 2,807,233, issued September 24, 1957, the same need not be described any further herein.

In order to remove any residual electroscopic toner particles which remain on the surface of insulating layer 125 after toner image transfer time but prior to the incremental surface areas thereof becoming charged once again by positive corona unit 126, another negative corona unit 132 as well as a rotating brush roller 133 are provided. This latter-mentioned roller is positioned within a suitable housing (not shown) for retaining the residual toner accumulated upon removal of the same from the xerographic drum surface. Furthermore, a vacuum cleaner unit (also not shown) may be positioned within the aforesaid housing so as to remove the accumulated residual toner therefrom.

Magnetic drum storage and printer control.—The selective printing operation provided by the subject xerographic printer, is governed by a data compare apparatus identified in Fig. 1 by reference numeral 134. The so-called cross-comparing operation performed by this apparatus is, in general, one wherein the primary card punched hole machine control data are compared with the secondary card punched hole machine control data caused to be sensed by card reading stations 38 and 55, respectively. In addition to providing a cross-compare operation, the apparatus 134 may be used to provide a

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sequence-comparing operation as to the punched hole data recorded in cards being fed through only a single feed unit, e.g., the primary card unit. This can be accomplished by a so-called data tumbling scheme which is disclosed and claimed in the copending U.S. patent application, Serial No. 554,254, which was filed by J. M. Sarley et al. on December 20, 1955, and which is described in connection with a xerographic printer in the afore-mentioned copending Kelly application.

A matched, or equal, data comparison condition which is recognized during any given machine cycle may be directed in the form of an electrical impulse from hub 288 of apparatus 134. On the other hand, an unmatched, or unequal, data comparison condition will appear as an impulse at either hub 287 or 289 depending upon whether the primary or the secondary card data are high. Any of these hubs may be connected electrically to a magnetic drum recording head 496, to thereby cause a magnetic bit to be recorded upon the magnetizable surface of drum 137 whenever an electrical impulse appears at the hub so connected. The magnetic drum 137 is mechanically connected to xerographic drum 49 in order that the two drums rotate in step with each other. Thus, when a recorded magnetic bit on the surface of the magnetic drum is detected at different successive times by the several independent magnetic drum read heads 69 and 497-500, suitable electrical signals are caused to be available at different periods of the printing machine operation to cause a variety of functions to take place relative to the synchronously driven xerographic drum. As the description advances, the electrical circuits and apparatus whereby some of these functions are caused to occur, will be described in sufficient detail insofar as the present invention is concerned. An erase head 495 is provided in order to remove any of the bits recorded on the surface of magnetic drum 137 by record head 496, only after these bits of information have been detected by the afore-mentioned read heads.

As is shown in Fig. 1, read heads 499 and 69 control the operation of the toner image card-transfer and web-transfer units, respectively. The preferred arrangement is one wherein the card-transfer control apparatus causes the card-transfer station 116 to effect a toner image print operation with respect to a secondary card 51, whenever the magnetic drum read head 499 detects the presence of a magnetic bit on the surface of drum 137. On the other hand, the web-transfer control apparatus is arranged to cause the web-transfer station 145 to effect a toner image print operation with respect to print receiving web 48, whenever the related read head 69 detects the absence of a bit on the surface of magnetic drum 137. Thus, insofar as the preferred arrangement is concerned, either one or the other of the transfer stations is always caused to operate at the exclusion of the other.

Web-transfer apparatus.—As stated previously, a toner image web-transfer apparatus of the type shown and described in the afore-mentioned copending Hix et al. patent application, is utilized in the subject xerographic printer. Referring to Figs. 1, 5 and 7, whenever a magnetic bit on drum 137 is detected by read head 69, an electrical signal is caused to be applied to the interposer magnet 105 (Fig. 5). The resulting energization of this magnet (see also Fig. 7), and the attraction thereto of armature 104 will cause interposer 106 of a mechanical storage device preferably used in place of the camming mechanism 57 (Fig. 1), to be moved so that the operating end of interposer 106 (Fig. 7) is caused to be placed into the path of a lug 107 on a trip lever 108. Inasmuch as the trip lever carrier 109 having trip levers 198 and stop locks 110 attached thereto, rotates continuously and in step with xerographic drum 49 by conventional drive means (not shown), the particular trip lever whose lug 107 is engaged by an interposer 106, is caused to pivot in a counterclockwise direction until the extended end of the trip lever 109 engages its related stop lock 110. As may be seen in

Fig. 7, a trip lever in this position, i.e., in an operating position, provides a camming end 111 which extends beyond the outer circumference of carrier 109. Thus, as the carrier rotates with a trip lever in an operating position, the camming end 111 thereof will subsequently engage the portion of L-shaped arm 50 which is identified by reference numeral 112. This, of course, will operate to shift the conductive transfer roller 146 away from the surface of xerographic drum 49 (see also Fig. 1) and into engagement with a web braking block 147. As is shown in Fig. 7, the carrier 109 has six trip levers 108 pivotally mounted thereon. Accordingly, the arrangement of these parts is such that the said carrier is rotated at such a speed as to effect the completion of one revolution thereof for every six printing machine card feed cycles.

Web-transfer apparatus control circuits.—This apparatus which is identified by reference numeral 71 in Fig. 1, is shown in detail in Fig. 5. Thus, whenever a magnetic bit on the surface of drum 137 is detected by read head 69, a resulting electrical impulse is initially applied to a conventional amplifier circuit 70. This circuit, in turn, causes a positive voltage signal of approximately 50 volts to be directed to the control grid 151 of a gas tube G1 via the capacitive coupling shown. The anode 152 of tube G1 is connected to a +115 volt source hub 153 through cam contacts C1 and relay R1, whereas the screen grid 154 is connected to a +42 volt source hub 155 by a resistor network. Suitable biasing is provided by connecting the tube cathode and control grid to voltage source 156. Thus, consequent upon the detection of a magnetic bit by read head 69 whereby a +50 volt impulse is applied as aforesaid to control grid 151, tube G1 will be caused to fire. This will bring about the energization of relay R1, whereupon its contacts R1a will transfer to complete a circuit to interposer magnet 105 (see also Fig. 7) when cam contacts C2 close. As described previously, the energization of a magnet 105 will cause a trip lever 108 (Fig. 7) to be set up so that the toner image web-transfer roller 146 (see also Fig. 1) will be shifted away from the surface of xerographic drum 49 at the proper time. Since clutch magnet 124 (Fig. 5) would not be energized at this time, the web drive mechanism 73 (Fig. 1) would be disabled. Furthermore, web 148 would be brought to an immediate halt by the braking action of roller 146 and member 147.

Referring once again to Fig. 5, the detection of the absence of a magnetic bit on drum 137 by read head 69 will result in the nonconduction of tube G1 and the de-energization of relay R1. Thus, a circuit will be completed via contacts R1a n/c (normally closed) to the web feed and punch mechanism clutch magnet 124 when cam contacts C3 close. As described previously, the energization of this clutch magnet and the resulting operation of the clutch (not shown) associated therewith will cause the web drive mechanism 73 (see also Fig. 1), the toner image fixing rollers 78, and the punch mechanism 72 to operate. Furthermore, since interposer magnet 105 (see Figs. 5 and 7) would not be energized during this machine cycle, transfer roller 146 (see also Fig. 1) would be in a position to effect a print transfer operation.

Card-transfer apparatus.—As mentioned previously, the toner image card-transfer apparatus employed within station 116 (Fig. 1), is similar to the transfer apparatus shown and described in the afore-mentioned copending Kelly patent application Fig. 9. The roller 348 (see also Fig. 9) for effecting the transfer of a toner image from the surface of insulating layer 125 (see also Fig. 1), onto the surface of a secondary card 51, is similar to transfer roller 146 which comprises, in general, an inner metallic conductive portion and an outer portion of very resilient or yielding material having an electrical resistance of at least 10^6 ohms per cubic centimeter. In order to transfer the xerographic drum supported toner images onto select secondary cards 51, the transfer roller

348 which is biased by spring 371 (Fig. 9) toward xerographic drum 49, is moved sufficiently to engage the xerographic drum surface during toner image card-transfer time so as to sandwich a secondary card between the photoconductive insulating layer of the xerographic drum and transfer roller 348. A positive potential is applied to this toner image transfer roller as it is to web-transfer roller 146 by way of its respective brush 376 to cause the initially negatively charged toner particles which define the image, to migrate from the surface of xerographic drum 49 onto the surface of the secondary card 51 at the card-transfer station 116.

Referring to Fig. 9, transfer roller 348 is secured to shaft 349 for rotation therewith. The lower, turned-over end 320 of member 359 is maintained in physical contact with another operating member 362 therefor by the action of a biasing spring 363. The member 362, in turn, is secured to a shaft 364 which is freely mounted in the printing machine frame and which has secured thereto for movement therewith a cam follower 366. A second biasing spring 367 maintains the turned-over portion 320 of member 359 in contact with the upper end of member 362. When the card-transfer roller control magnet 368 is de-energized by means to be described shortly, the armature 369 thereof latches the cam follower member 366 at its upper limit, whereby arm 359 is caused to be pivoted about shaft 361 in its most clockwise limit. The amount of shifting movement needed, and actually provided, is simply that which is enough to remove the transfer roller 348 completely away from the surface of the xerographic drum 49. The feed roller 87 which is not caused to shift, is maintained in constant contact with its companion card feed roller 86 due to the ever constant biasing action of spring 371.

Consequent upon the energization of magnet 368 via circuits to be described shortly, the armature 369 thereof is caused to unlatch the cam follower arm 366 so that the cam follower roller 372 thereof is permitted to ride on the periphery of cam 373. Thus, with the unlatching of cam follower arm 366, arm 359 is permitted to move to its most counterclockwise limit, whereupon transfer roller 348 is caused to move radially toward xerographic drum 49.

Card-transfer apparatus control circuits.—It has been brought out hereinbefore that read head 499 (see Figs. 1 and 6a) associated with magnetic drum 137, is used to govern the operation of the toner image card-transfer apparatus within station 116. Referring specifically to Fig. 6a, suitable circuit operating potentials are obtained from sources 157—159. In response to the detection of a magnetic bit on the surface of drum 137 by read head 499 at a time when cam contacts C4 are closed, a corresponding electrical impulse is caused to be directed from this read head through the aforesaid contacts C4, via line 501, to the control grid of vacuum tube V1, preferably one-half of a type 12AY7 tube. The circuit arrangement is such that a negative-going impulse is caused to be applied to the control grid of this first tube, whereby a positive-going impulse is then applied to the control grid of vacuum tube V2. Hence, an amplified negative-going impulse is applied to the control grid of vacuum tube V3, and a still further amplified positive-going impulse is directed to the control grid of vacuum tube V4. As a result, a positive-going impulse will appear at the output of the cathode follower tube V4, which said impulse is directed via contacts R30c, line 502, and cam contacts C5, to the control grid of a gas tube G2 (preferably a type 2D21 tube). Hence, whenever such a positive-going impulse is caused to be applied to the control grid of thyratron tube G2, the said tube is ignited and read magnet R39 is energized via a circuit which includes cam contacts C6. A neon indicator tube N1 is also used as shown so as to provide a visual indication of the operation of tube G2 so that whenever tube

G2 is caused to conduct, its associated neon tube N1 will also conduct.

In response to the energization of relay R39 as a result of the detection of a magnetic bit by read head 499 as afore-described, relay contacts R39b (Fig. 6b) are caused to close, to thereupon complete a circuit to magnet 368 which governs the operation of card-transfer roller 348.

APPARATUS FOR FORMING IMPRINT OF ORIGINAL DESIGN

As brought out previously, when it is desired to form an imprint of original design, information from a plurality of light image information sources is caused to be projected onto, and then stored as a composite latent electrostatic image on, the surface of the photoconductive insulating layer of the xerographic drum.

Example 1.—It is customary in the publishing field for publishing firms to send out promotional material at various times of the year to potential customers. Each of these efforts to acquire new readers is properly termed an "effort" in the trade, and each one of these efforts is identified by a so-called "key" number. Thus, during the time that such promotional material including that to be returned, e.g., post cards, is being prepared, it is desirable that the effort-key number be imprinted on the material to be returned so that it can later be ascertained which particular effort brought about a response from a recipient of the promotional material for the said effort.

Referring to Fig. 1, a rotatable transparent cylinder 37 having a transparent mask 36 (see also Fig. 8) with light opaque data 35 thereon secured to the surface thereof, is caused to rotate in timed relation with the feeding of primary cards 21 past the optical scanning station 39. In particular, the movement of mask 36 is such as to interpose the light opaque data 35 between a light source 45 within the aforesaid cylinder 37 and the xerographic drum surface layer 125 at those particular times defined on the xerographic drum surface by the distance between successive primary cards, during which times light energy would ordinarily be directed onto the said layer 125. That is, during those periods that there is no primary card being scanned by station 39 because of the gap between successively fed primary cards 21 (see Fig. 2), mask 36 on cylinder 35 is moved to in effect fill in this gap. This action, of course, will prevent the discharge of those incremental areas of the electrically charged drum surface layer 125 that correspond to the design configuration of the data 35 whenever the same is interposed between light source 45 and photoconductive insulating layer 125. Thus, if the effort-key number identified in Fig. 8 by the reference numeral 35, is inscribed by way of opaque material on the afore-mentioned transparent mask 36, a latent electrostatic image 32 (see also Fig. 2) of this number may be stored on the photoconductive layer 125 of xerographic drum 49. The cylinder 37 can be arranged for movement within the printing machine in the same way as is cylinder 279 (Fig. 10) to be described in detail shortly in connection with a second example.

Referring now to Fig. 3, the primary card source information 26 is reproduced on the present example on the charged surface of xerographic drum 49 (see also Fig. 2) as an image 27. As stated previously, this is accomplished via the light scanning operation afforded by apparatus including the scanning station 39 (see also Fig. 1). Thus, by positioning mask 36 (Fig. 8) in a predetermined place on cylinder 37, the image 32 (Fig. 2) of data 35 (Fig. 8) can be arranged in any suitable fashion relative to the image 27 (Fig. 2) of primary card source information 26. Of course, to produce an original design which includes information from these two sources, the arrangement of the latent electrostatic images 27 and 33 on the xerographic drum surface is such that a secondary card 51 having corresponding toner imprints 28 and

34, respectively, will be produced. It should be clear that the design realized as a result of the imprints 28 and 34 being made on a single print receiving material, such as secondary card 51 for example, will afford a new and original toner image design of matter derived from a plurality of image sources.

Example 2.—The operation to be described presently in connection with another original or composite latent image forming apparatus requires that each source information primary card 21 (Fig. 3) have, in addition to the source information 26, a dark area 66 thereon. Thus, as each primary card 21 (see also Fig. 1) is moved past the optical scanning station 39, a latent electrostatic image of the source information 26 (Fig. 3) thereon as well as that of the dark area 66 (preferably black) may be stored on the surface of xerographic drum 49. Thus, at a later time as such latent electrostatic image of the dark area 66 is moved past optical station 127 (Fig. 1), additional design information can be stored on the surface of the xerographic drum within the limits of the said area thereon which corresponds to the dark area 66 (Fig. 2) on a primary card 21. The apparatus within optical station 127 (Fig. 1) includes a light source 281 (Fig. 10) which is positioned within a rotatable opaque cylinder 279. This cylinder supports a transparent mask 284 (Fig. 12) which would have inscribed thereon in light opaque material the source information 285 to be stored on the surface of xerographic drum 49 (Fig. 2) within the limits of the latent image corresponding to the dark area 66 (Fig. 3). Of course, the portion of the surface of cylinder 279 to which mask 284 is secured would also be transparent. Hence, the opaque material depicting source design information 285 (Fig. 12) on mask 284 would interrupt the transmission of light energy from source 281 onto corresponding surface area portions of the xerographic drum. Of course, the remaining light transparent areas of mask 284 and cylinder 279 would effectively discharge the remaining portions of the latent electrostatic image which corresponds to the dark area 66.

Cylinder 279 (Fig. 10) can be rotated in a timed relation to the rotation of xerographic drum 49 whenever the clutch 83 (Fig. 13) which is also shown in detail in Fig. 11, is operated. The cylinder is normally stationary when the aforesaid clutch is disabled and the mask 284 is positioned so as not to be between light source 281 and the surface of xerographic drum 49.

Referring to Fig. 10, pulley 266 is rotated continuously via the printer main drive mechanism (not shown) so that the one-tooth disk 272 (see also Fig. 11) which is an integral part of this pulley, is caused to rotate by its aforesaid drive mechanism around a bearing 271. A spring-biased dog 273 is pivotally mounted on a stud 274 which is affixed at one end thereof to a circular member 276 (Fig. 10) that, in turn, has secured thereto a pin 277 for movement therewith by conventional means not shown. This pin projects into a suitable aligning slot 273 (see also Fig. 12) to be found in the masking cylinder 279. It should be clear that the pin-slot arrangement used is not only to align the cylinder 279 timewise with the printing machine drive means, but to also impart the necessary driving motion to the cylinder.

As stated previously, an elongated light source 281 (Fig. 10) is arranged within the generally opaque cylinder 279, and is supported at either end thereof by conventional light tube sockets for both supporting the light tube and for providing proper electrical connections thereto. During those periods that the afore-mentioned clutch dog 273 (Fig. 11) is not engaged with the single tooth in disk 272, the cylinder 279 (see also Fig. 10) is held stationary. Furthermore, as stated previously, this masking cylinder when stationary is in a position such that light energy is prevented from being transmitted from light source 281 through the transparent cylinder 279 as well as a suitable lens arrangement depicted by

member 291, onto the electrically charged surface of the xerographic drum. When the clutch magnet 282 (Fig. 11) is caused to be energized, the armature 283 thereof is caused to unlatch the spring-biased dog 273 which, in turn, is caused to engage the continuously rotating one-tooth disk 272. In view of the fact that this disk rotates continuously, and since the clutch dog 273 is mounted on a stud 274 which is fixed at one end thereof to the afore-mentioned member 276 (Fig. 10), the masking cylinder 279 is caused to rotate along with member 276 when magnet 282 is energized, via the pin-slot connection afforded by pin 277 and slot 278.

It should be clear that there can be had on hand any number of cylinders 279, each of which has a different mask 284 thereon. A masking cylinder 279 can be inserted in place of another such cylinder simply by removing the end member 292 (Fig. 10) which is held in place by a conventional jar cover type spring 287. Once the end member 292 is removed, the cylinder 279 may be removed and another cylinder inserted in its place. Assurance may be had that the new masking cylinder is in alignment with the xerographic drum of the printing machine when slot 278 is aligned with drive pin 277. It might be mentioned here that cylinder 37 (Fig. 8) may be handled similarly to cylinder 279.

The lens means 291 is necessary, of course, to project the light rays in focus on the surface of the xerographic drum. Thus, as the mask 284 is moved relative to the xerographic drum, an area of the surface thereof corresponding to the area covered by the opaque design 285 will be masked from light energy produced by light source 281. Wherever light transparent areas exist within the mask, light energy will be transmitted through these areas in a direction substantially normal to the surface of the xerographic drum, so as to effect a storage of the information 285 (Fig. 12) depicted by a light opaque design configuration.

OPERATION

Some of the various operations which can be performed with the present printing machine, can be enumerated in general terms as follows:

(1) A card-to-card operation whereby a facsimile of primary card source information is reproduced on a secondary card.

(2) A card-to-web operation whereby a facsimile of primary card source information is reproduced as one of a list of items on a web of continuous print receiving material.

(3) A selective card-to-card or card-to-web operation whereby a facsimile of primary card source information may be selectively reproduced on either a secondary card or a web.

(4) An original design imprint operation similar to each of the foregoing operations but for the formation of a composite image by combining images from a plurality of sources such as, for example, optical scanning station 39 (Fig. 1), masking cylinder 37 and optical station 127.

Thus, the subject printing machine might be used to perform a card-to-web or a card-to-card operation whenever it were desired to transfer source information 26 (Fig. 3) from a primary card 21 (see also Fig. 1) onto either a related secondary card 51 or, if there were no such related secondary card, a succeeding position 29 (Fig. 2) of a continuous print receiving web 148. It should be clear from what has been stated hereinbefore that this general operation could be one which additionally includes the forming of an original design composite latent electrostatic image by projecting information from a source other than the afore-mentioned primary card, onto the surface of the xerographic drum. To explain the latter-mentioned operation more clearly, as each primary card 21 (see Figs. 1 and 2) having source information 26 and machine control data 30 (see also Fig. 3) thereon and as each secondary card 51 having machine control data

thereon is advanced past its respective perforated data reading stations 38 and 55, the perforated control data, such as data 30 (Fig. 3) in the primary card for example, in each of the aforesaid cards would be sensed. Furthermore, these machine control data would be read into, and then compared by, the data comparing apparatus 134 (Fig. 1). This apparatus which was described briefly hereinbefore, could be comprised of a plurality of data storing and comparing devices such as are shown and described in the Patent No. 2,442,970 that issued to F. M. Carroll et al. on June 8, 1948. Each of the data storing devices is in fact, a data identifying element which is settable to positions corresponding to incoming data signals. Accordingly, data identifying elements (not shown) which can be operatively connected to the secondary card brush reading station, for example, would be settable to positions corresponding to the data recorded in the secondary cards. Thus, when the data recorded in a primary card would match the setting of the aforesaid data identifying elements, an equal signal would be directed from hub 288 (Fig. 1). In view of the fact that such a comparing device is not a part of this invention per se, and since the same is described in detail in the Carroll et al. patent, and for use with a xerographic printer in the afore-mentioned copending Kelly application, it is believed to be unnecessary to describe this apparatus 134 any further. Suffice it to say for the operation being described that should the primary and secondary card machine control data be equal, a suitable electrical impulse will be available at equal output hub 288. On the other hand, if the primary card control data be of a lower magnitude than the secondary card control data, an electrical impulse will be available at low primary output hub 287. Similarly, a low secondary condition will cause an impulse to be available at low secondary output hub 289. Thus, to perform an operation whereby the facsimile of source information 26 (see also Fig. 2) on a primary card 21 which is related to a secondary card 51, is to be reproduced on this secondary card, the equal output hub 288 (Fig. 1) of data comparing unit 134 must be electrically connected to the magnetic drum record head 496. Hence, whenever the secondary card control data are equal to the primary card control data, a magnetic bit will be recorded on the magnetic drum 137 via record head 496. This can be effected by conventional circuitry similar to that shown in Fig. 15 of the afore-mentioned copending Kelly application. Thus, when the recorded magnetic bit is subsequently moved past the web-transfer read head 69 (Fig. 1), the circuit shown in Fig. 5 hereof will operate to de-energize magnet 105. Thereupon, web-transfer roller 146 (Fig. 1) will be placed in a position away from the surface of the xerographic drum, and accordingly, a toner image transfer will not be effective with respect to web 148 at web-transfer station 145. On the other hand, as the aforesaid recorded magnetic bit is moved past the card-transfer read head 499, the previously described circuit which is associated with this magnetic head and is shown in Fig. 6a hereof, will cause operation of the magnet 368 (Fig. 6b), to thereby bring about the movement of card-transfer roller 348 toward the surface of xerographic drum 49. Accordingly, the toner image thereon will be transferred onto a secondary card 51 which was being advanced through card-transfer station 116. Of course, the timing of the printing machine in general, and the amount of time delay effected by the recording of the aforesaid magnetic bit on drum 137, is such that the particular secondary card 51 being moved through the card-transfer station 116 at print time would be the secondary card whose perforated control data were previously compared with that data 30 (Fig. 3) of the related primary card 51 by data comparing apparatus 134 (Fig. 1). It will be recalled that it was as a result of this data comparison that the aforesaid magnetic bit

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was initially caused to be recorded on the magnetic drum 137 by record head 496.

On the other hand, should a pair of unrelated primary and secondary cards, i.e., cards having unmatched machine control data, be moved past their respective card reading stations 38 and 55, there would be no magnetic bit recorded on the surface of magnetic drum 137. This is due to the inequality of the perforated control data in each of the cards, whereupon no signal would appear at equal hub 288 which is plug wired to record head 496. Thus, when the particular surface area of magnetic drum 137 whereat a bit might have been recorded had the aforesaid primary and secondary cards been related ones, is moved past the web-transfer read head 69, the control circuit therefor shown in Fig. 5 will be operated to effect the energization of magnet 105. This, as described hereinbefore, will cause the web-transfer roller 146 to be moved toward the surface of xerographic drum 49, as well as to cause the web drive mechanism 73 to operate. Accordingly, this will effect a toner image transfer onto the surface of web 148. At a later time when the aforesaid particular area of magnetic drum 137 whereat a bit might have been recorded had the primary and secondary cards been related ones, is moved past the card-transfer read head 499, the control circuitry associated therewith (shown in Figs. 6a-6b hereof) will effect the de-energization of magnet 368 (see also Fig. 9), whereupon the card-transfer roller 348 will be placed at a position away from the surface of xerographic drum 49. Hence, there would not be a toner image transfer onto a secondary card 51 at card-transfer station 116 at this time. Thus, in accordance with the relationship and relative magnitude of the primary card and secondary card perforated control data, the source information 26 (Fig. 2) on each primary card 21 can be transferred as design 29 onto either web 148 or as design 28 onto a related secondary card 51.

To emphasize the practicality of the foregoing machine operation, reference may be had to the drawings shown in Figs. 2-4 which diagrammatically depict an operation in which a secondary card 51 as printed would represent a negotiable check to be paid out to an employee, for example, whereas the primary cards 21 would represent the master payroll file of all employees. Since an employee might be absent from his work during any given pay period, there will almost without exception always be a greater number of master payroll primary cards 51 than there would be pre-punched secondary cards. Thus, as each aforesaid primary card 21 is advanced by its feed unit, the source information 26 thereon will subsequently be transferred onto web 148 as a toner image 29 only if there is no related negotiable check secondary card 51. On the other hand, the master payroll file primary card source information 26 will be reproduced as image 28 on a related secondary card 51, as described hereinbefore. The source information 26 on a primary card 21 would in most cases be the employee's name and address used for identification purposes. The signature 68 of the employer's treasurer might also be added during this latter-mentioned matched primary and secondary card data operation by projecting an optical image 67 thereof (Fig. 2) from optical source 127 (see also Fig. 1) which includes masking cylinder 279 (Fig. 12). Since the mask supporting cylinder 279 (Fig. 10) within optical source 127 is clutch controlled as aforesaid, the image 67 (Fig. 2) of the treasurer's signature 68 (Fig. 3) can be selectively reproduced on the xerographic drum surface only when there exist related or matched primary and secondary cards. Thus, where such a matched data condition does not exist, the image 67 (Fig. 2) will not be formed on the surface of xerographic drum 49. In addition to the identifying information 28 (Fig. 4) and the treasurer's signature 68 on a negotiable check secondary card 51, other information

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such as the pay period or time of check issuance may also be produced. This latter information is identified in Fig. 4 by reference numeral 34, and is produced from the mask 36 (see also Fig. 8) on rotating cylinder 37 (Fig. 2) as was the "effort-key" number produced in Example 1 hereinbefore. Accordingly, the information 35 (Fig. 8) may be reproduced as latent electrostatic image 32 on the surface of xerographic drum 49 which, in turn, may be reproduced as toner image 34 on negotiable check secondary card 51 or as toner image 33 on web 148.

It should be recognized that by disabling either the web-transfer station control apparatus (Fig. 5) or the card-transfer station control apparatus (Figs. 6a-6b), the present printing machine can be used as either a card-to-web printer as shown and described in the aforementioned copending Hix et al. patent application, or a card-to-card printer as shown and described in the aforementioned copending Kelly case. Furthermore, by using the masks on transparent cylinders 37 (Fig. 2) and/or 279 as already described, an imprint of original design may be had.

It should also be clear that the present printer can be governed by comparing data signals from a data generator 161 (Fig. 1) with the primary card control data. Thus, for example, only the source information on so-called equal primary cards may be reproduced xerographically.

Summary

The preferred embodiment of the present invention pertains to a xerographic printing machine capable of producing a facsimile 28 (Fig. 4) of information which appears on primary cards 21 (see also Fig. 3) as source information 26, as well as a facsimile of information 34 (see Fig. 2) and 68 which is caused to be projected onto the surface of xerographic drum 49 from other information sources for producing latent electrostatic images 32 and 67, respectively. The arrangement of the latent electrostatic images 27, 32 and 67 caused to be produced from a plurality of different image sources as aforesaid, is such as to produce a composite latent electrostatic image which when developed by electroscopic toner and transferred as an original design toner image onto a secondary card 51, results in the formation of original document. Furthermore, in accordance with the relative magnitude of primary and secondary card machine control data, imprints of original design may be produced selectively on either a print receiving web 148 or secondary card 51.

The latent electrostatic image 27 of the primary card source information 26 is produced by the optical scanning of this information while a primary card 21 is moved through an optical scanning station 39 (see also Fig. 1). The other latent electrostatic images 32 (Fig. 2) and 67 are produced by rotating a pair of transparent cylinders 37 and 279 in timed relationship with the movement of xerographic drum 49 so that their respective light opaque data 35 (Fig. 8) and 285 (Fig. 12) masks are interposed between the xerographic drum surface and light sources 45 and 281, respectively. In view of the physical location of optical source unit 127 (see also Fig. 1) with respect to optical scanning station 39, it is necessary to prevent the discharge of the electrical charge on an area of drum 49 which is depicted by reference numeral 67. This is accomplished by having a corresponding dark area 66 on each primary card 21. Thus, as the mask 285 (Fig. 12) on cylinder 279 is interposed between light source 281 and the xerographic drum, all of the electrical charge within a corresponding area identified in Fig. 2 by reference numeral 67, will be removed except for that charge defined by the design configuration of the light-opaque data thereon.

It must be recognized that the printing operations described hereinabove which can be performed on the

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present xerographic printing machine, are only examples, and are provided only for descriptive and illustrative purposes. Many other innumerable operations can be performed with this highly flexible and versatile machine, and many features such as selective primary and secondary card feeding and card stacking not brought out in the present specification can also be availed of. Hence, while there have been shown and described and pointed out the fundamental novel features of the invention as applied to a preferred embodiment, it would be understood that various omissions and substitutions and changes in the form and details of the devices illustrated in their operation may be made by those skilled in the art, without departing from the spirit of the invention. It is the intention, therefore, to be limited only as indicated by the scope of the following claims.

What is claimed is:

1. In an electrophotographic printer for producing imprints of original design on a surface of one of a pair of print receiving materials, the combination of a first optical source information emitting means; a second optical source information emitting means; a rotatable drum having a photoconductive insulating layer thereon for storing latent electrostatic images having the configuration of optical images projected thereon; means for electrically charging said photoconductive insulating layer; means for operatively connecting said charged layer with said first and said second optical source information emitting means so that a composite latent electrostatic image of original design as defined by the source information of both aforesaid emitting means is stored on said layer; means for developing said composite latent electrostatic image by applying an electroscopic toner to the surface of said layer; a pair of spaced print stations each of which is adapted to effect the transfer of a toner developed composite latent electrostatic image onto a surface of different print receiving material; means for rotating said drum so that sequential incremental surface areas of said layer are moved successively past said first and said second optical source information means, said composite latent electrostatic image developing means, and each of said pair of spaced print stations; and means for operating one of said pair of print stations to the exclusion of the other thereof so as to cause the transfer of said toner developed composite latent electrostatic image onto the surface of a print receiving material related to said operating print station.

2. In an electrophotographic printer for selectively producing imprints of original design on any single one of a plurality of different print receiving materials; a rotatable drum having a photoconductive insulating layer thereon for storing latent electrostatic images; a plurality of independent optical source information emitting means; means for electrically charging said photoconductive insulating layer; a plurality of spaced print stations each of which is adapted to effect the transfer of a toner developed latent electrostatic image onto a surface of a different print receiving material; means for developing latent electrostatic images by applying electroscopic toner to the surface of said layer; means for rotating said drum so as to move sequential incremental surface areas of said layer successively past said layer charging means, each of said plurality of independent optical source information emitting means, said toner image developing means, and each of said plurality of spaced print stations; means for operatively connecting said sequential incremental surface areas of said charged layer successively with each one of said plurality of independent optical source information emitting means to cause a composite latent electrostatic image of original design as defined by the source information of all of the aforesaid emitting means to be stored on said photoconductive insulating layer; and means for operating one of said plurality of print stations to the exclusion of the others thereof so as to cause the transfer of said composite toner developed image onto the surface

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of a print receiving material related to said operating print station.

3. In a xerographic printer comprising a rotatable drum having a layer of insulating material thereon for storing a latent electrostatic image, and means for developing said latent electrostatic image by applying electroscopic toner to the surface of said layer, the combination of a pair of spaced print stations each of which is adapted to effect the transfer of said toner developed latent electrostatic image onto a surface of a different print receiving material, means for rotating said drum so that sequential incremental surface areas of said layer are moved successively past said toner image developing means and each of said pair of spaced print stations, and means for operating one of said pair of print stations to the exclusion of the other thereof so as to cause the transfer of said toner developed latent electrostatic image onto the surface of a print receiving material related to said operating print station.

4. In a xerographic printer comprising a rotatable drum having a layer of insulating material thereon for storing a plurality of successively arranged latent electrostatic images, and means for developing each of said latent electrostatic images by applying electroscopic toner to the surface of said layer, the combination of a pair of spaced print stations each of which is adapted to effect the transfer of said toner developed latent electrostatic images onto a surface of a different print receiving material, means for rotating said drum so that sequential incremental surface areas of said layer are moved successively past said image developing means and each of said pair of spaced print stations, and means for selectively operating one of said pair of print stations to the exclusion of the other for each of said plurality of successively arranged latent electrostatic images stored on said layer of insulating material, so as to effect the transfer of each of said toner developed latent electrostatic images onto the surface of a respective one of said print receiving materials related to said operating print station.

5. In an electrophotographic printer for copying record card source information onto the surface of one of a plurality of different print receiving materials; means for optically scanning record card source information; means for moving record cards bearing source information past said optical scanning means; movable photoconductive insulator means for storing a latent electrostatic image corresponding to the configuration of an optical image projected thereon; means for operatively connecting said optical scanning means and said photoconductive insulator means to cause a latent electrostatic image of record card source information to be stored in said photoconductive insulator means consequent upon a single record card being advanced past said optical scanning means; means for developing a latent electrostatic image by applying a pigmented transferable material to the surface of said photoconductive insulator means; operable first means for transferring a developed latent electrostatic image onto a first print receiving material; operable second means for transferring a developed latent electrostatic image onto a second print receiving material; means for moving sequential incremental surface areas of said photoconductive insulator means successively past said optical-scanning and image-storing connecting means, said latent electrostatic image developing means, and said first and said other developed latent electrostatic image transferring means at a speed correlated with the speed of feeding record cards past said optical scanning means; and means for operating one of said developed image transferring means to the exclusion of the other so as to cause the transfer of a developed latent electrostatic image onto the surface of a print receiving material which is related to the one of said developed image transferring means rendered operated.

6. In a record card controlled electrophotographic printer comprising a rotatable drum having a photocon-

ductive insulating layer thereon for storing a plurality of successively arranged latent electrostatic images, and means for developing said images by applying electroscopic toner to the surface of said layer; the combination of record card data analyzing means; means for feeding record cards in seriatim past said analyzing means; a pair of spaced print stations, one of which is normally disabled, the other of which is normally operative, and each of which is adapted to effect the transfer of a toner developed image onto a surface of a different print receiving material; means for rotating said drum so that sequential incremental surface areas of said layer are moved successively past said image developing means and each of said pair of print stations; and print station selecting means controlled by said record card data analyzing means for periodically operating said normally disabled print station to the exclusion of the other one of said print stations so as to cause the transfer of a toner developed image onto the surface of the respective one of said different print receiving materials related to said operating print station.

7. In a record card controlled electrophotographic printer for copying record card source information; means for optically scanning record card source information; record card data analyzing means; means for feeding record cards in seriatim past said scanning means and said data analyzing means; a rotatable drum having a photoconductive insulating layer thereon for storing latent electrostatic images corresponding to the configuration of optical images projected thereon; means for operatively connecting said optical scanning means and said layer so that latent electrostatic image of record card source information is stored thereon consequent upon a record card being fed past said optical scanning means; means for developing said latent electrostatic images by applying an electroscopic toner to the surface of said layer; a pair of spaced print stations, one of which is normally disabled, the other of which is normally operative, and each of which is adapted to effect the transfer of a toner developed image onto a surface of a different print receiving material; means for rotating said drum so that sequential incremental surface areas of said layer are moved successively past said electroscopic toner applying means and each of said pair of print stations at a speed correlated with the speed of feeding record cards past said optical scanning means; and print station selecting means controlled by said data analyzing means for periodically operating said normally disabled print station to the exclusion of the other one of said print stations so as to cause the transfer of a toner developed image onto the surface of the one of said print receiving materials related to said operating print station.

8. In a record card controlled printer of the class described comprising a rotatable electrophotographic drum having a photoconductive insulating layer thereon for storing a plurality of successively arranged latent electrostatic images, and means for developing said images by applying electroscopic toner thereto; the combination of a pair of print stations, one of which is normally disabled, the other of which is normally operative, and each of which is adapted to effect the transfer of a toner developed image onto a surface of a different print receiving material; means for rotating said drum so that sequential incremental surface areas of said layer are moved successively past said electroscopic toner applying means and each of said pair of print stations; record card data analyzing means; data comparing means operatively connected with said data analyzing means and including data identifying elements settable to positions corresponding to data in certain record cards being analyzed; means for feeding record cards in seriatim past said data analyzing means; and means controlled by said comparing means when the setting of said identifying elements compares with the data in said certain record cards for periodically operating said normally disabled print station to the ex-

clusion of the other one of said pair of print stations to cause the transfer of a toner developed image onto the surface of the one of said print receiving materials related to said operating print station.

9. In a record card controlled printer of the class described comprising a rotatable electrophotographic drum having a photoconductive insulating layer thereon for storing a plurality of successively arranged latent electrostatic images, and means for developing said images by applying electroscopic toner thereto; the combination of a pair of print stations, one of which is normally disabled, the other of which is normally operative, and each of which is adapted to effect the transfer of a toner developed image onto a surface of a different print receiving material; means for rotating said drum so that sequential incremental surface areas of said layer are moved successively past said electroscopic toner applying means and each of said pair of print stations; record card data analyzing means; means for feeding record cards in seriatim past said data analyzing means; comparing means operatively associated with said data analyzing means and including data identifying elements settable to positions corresponding to data in certain record cards being analyzed; a rotatable data storage magnetic drum; means controlled by said comparing means to cause a magnetic spot to be recorded on the surface of said magnetic drum only when the setting of said identifying elements compares with data in said certain record cards; means for rotating said magnetic drum in timed relation with the rotation of said electrophotographic drum; and means including a magnetic drum read head for selectively operating said normally disabled print station to the exclusion of the other one of said pair of print stations consequent upon said read head detecting the presence of a magnetic spot on said magnetic drum, to thereby cause the transfer of a toner developed image onto the surface of the one of said print receiving materials related to said operating print station.

10. In a record card controlled electrophotographic printer comprising a rotatable drum having a photoconductive insulating layer thereon for storing a plurality of successively arranged latent electrostatic images, and means for developing said latent electrostatic images by applying an electroscopic toner to the surface of said layer, the combination of a normally operative first print station which is adapted to effect the transfer of a toner developed image onto the surface of a print receiving web, a normally disabled second print station which is adapted to effect the transfer of a toner developed image onto the surface of a print receiving record card, primary record card data analyzing means, print receiving record card data analyzing means, means for feeding primary record cards past said primary card data analyzing means, means for feeding print receiving record cards successively past said print receiving record card data analyzing means and said normally disabled second print station, comparing means governed by said primary record card and said print receiving record card data analyzing means, said comparing means including data identifying elements controlled by said print receiving record card data analyzing means and settable to positions corresponding to data in certain primary record cards being analyzed, means for rotating said drum so that sequential incremental surface areas of said layer are moved successively past said toner applying means and each of said print stations, and means governed by said comparing means for periodically operating said normally disabled second print station to the exclusion of said first print station only when the setting of said identifying elements compares with data in said certain primary record cards, to thereby cause the transfer of a toner developed image onto the surface of a print receiving record card.

11. In a record card controlled electrophotographic printer comprising a rotatable drum having a photoconductive insulating layer thereon for storing latent electrostatic images, the combination of two optical source in-

formation emitting units, one of which is normally disabled, the other of which is normally operative, and each of which is adapted to project respective optical source information onto the surface of said photoconductive insulating layer; means for electrically charging said photoconductive insulating layer; means for rotating said drum so that sequential incremental surface areas of said charged photoconductive insulating layer are moved past said two optical source information units successively, to thereby produce on said photoconductive insulating layer a latent electrostatic image which is a facsimile of the source information produced by said normally operative optical source information emitting unit; record card data analyzing means; means for feeding record cards in serial past said analyzing means; and means controlled by said data analyzing means for operating said normally dis-

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abled optical source information unit in timed relation with the operation of said normally operative optical source information unit so as to store a composite latent electrostatic image of original design as defined by the source information of said two emitting units on said layer.

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