United States Patent

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[54] **LABEL-MAKING SYSTEM**
29 Claims, 16 Drawing Figs.

[52] **U.S. Cl.** **355/29,** 355/43, 355/49, 355/51, 355/65
[51] **Int. Cl.** **G03b 27/70**
[50] **Field of Search** 355/29, 43, 49, 51, 64, 65

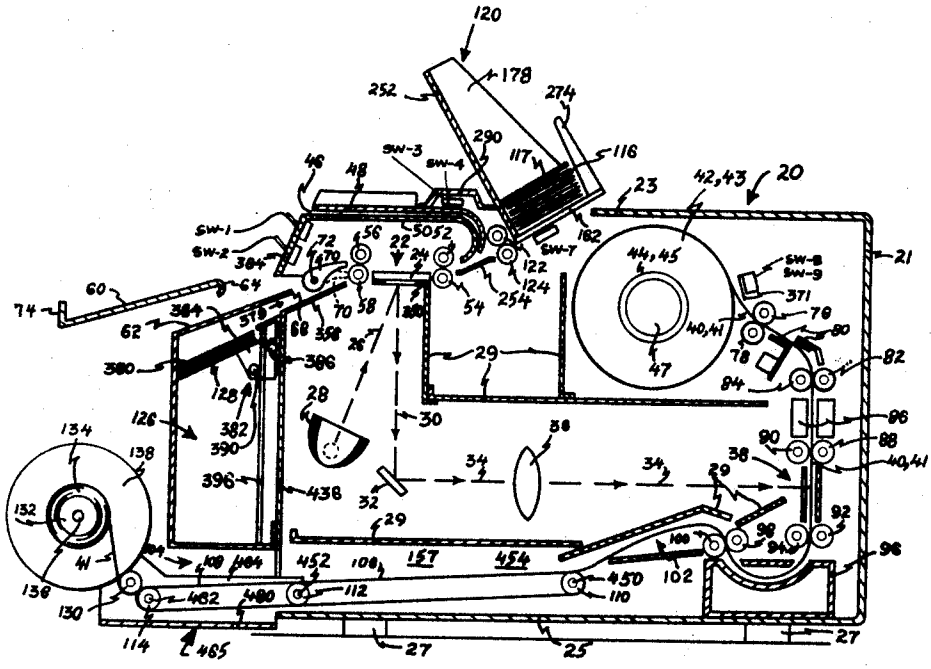
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ABSTRACT: A deck of tabulating cards having names and addresses printed thereon in legible form is used as a master mailing list. The cards are passed through a photocopying machine which, in addition to the usual document copying facilities, has equipment for tabulating card handling. The cards are copied automatically in rapid sequence and in overlapping relationship, so that a series of names and addresses is printed on a continuous strip of copy paper with a minimum of blank space between. Various aspects of the operation of a conventional photocopying machine are altered to achieve a continuous card copying cycle. A continuous output strip emerges from the photocopying machine, and is subsequently processed by conventional labeling machinery which severs the strip into individual address labels and glues these to respective pieces of mail.



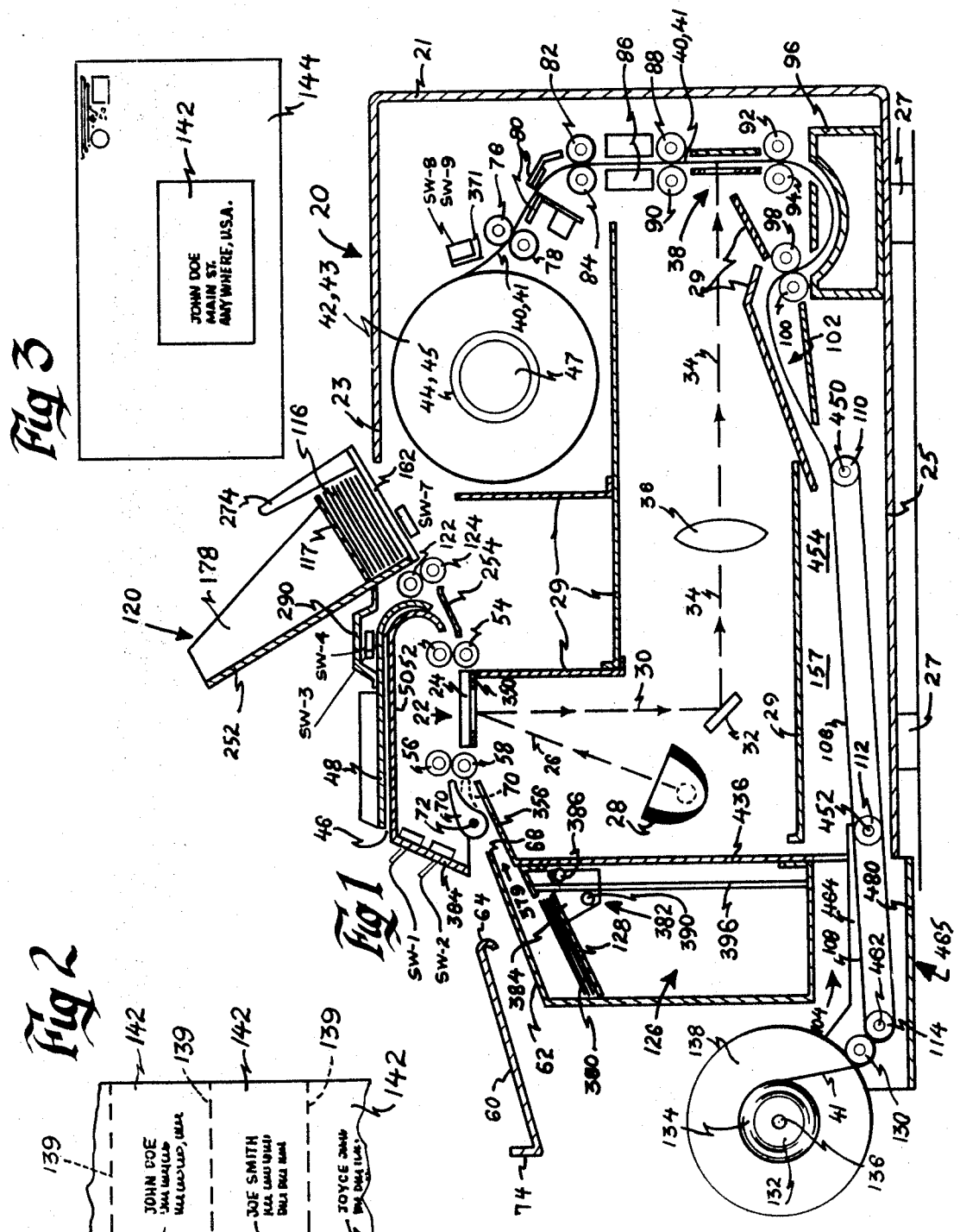


Fig 1

Fig 2

Fig 3

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Fig 4

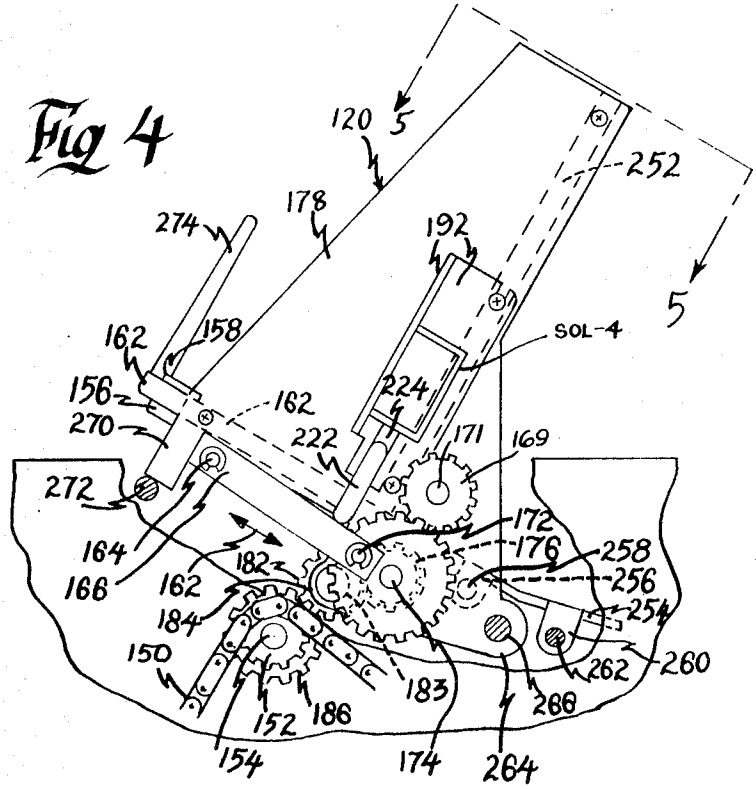
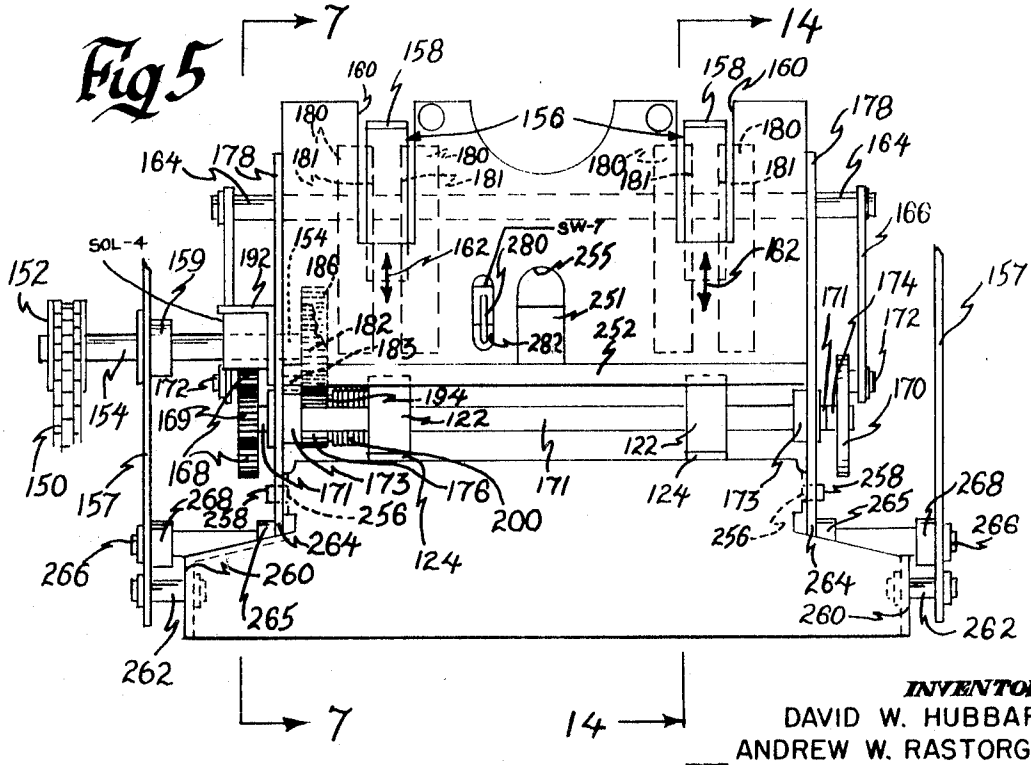

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Fig 5


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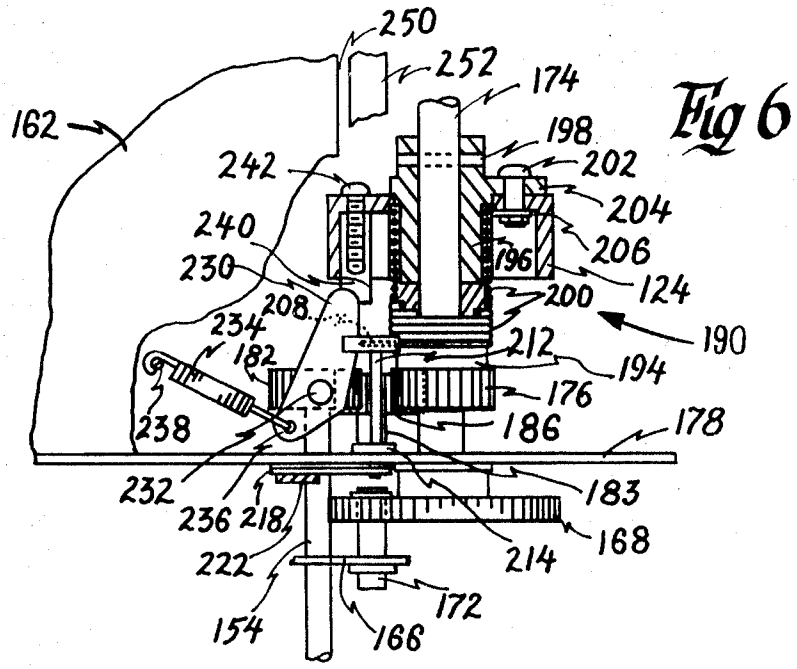


Fig 6

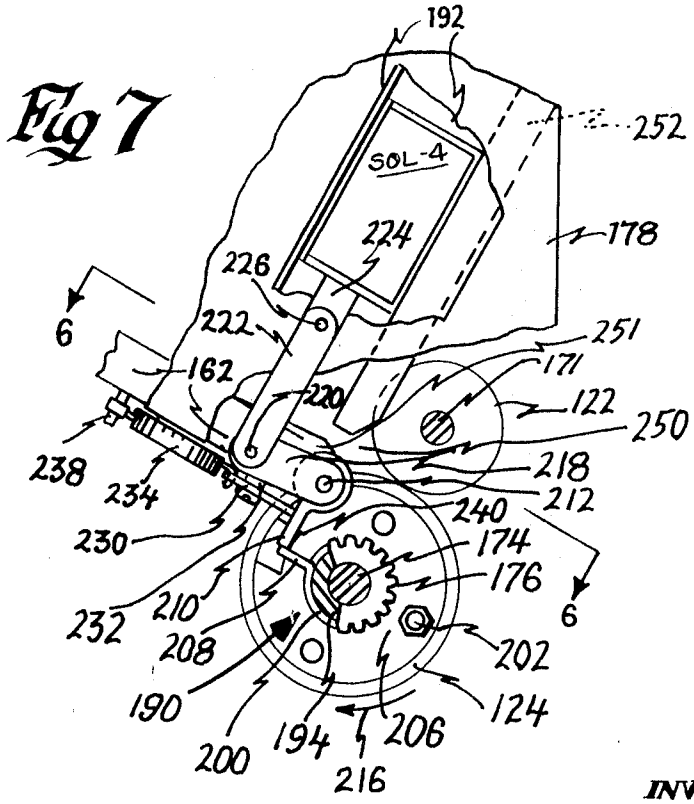


Fig 7

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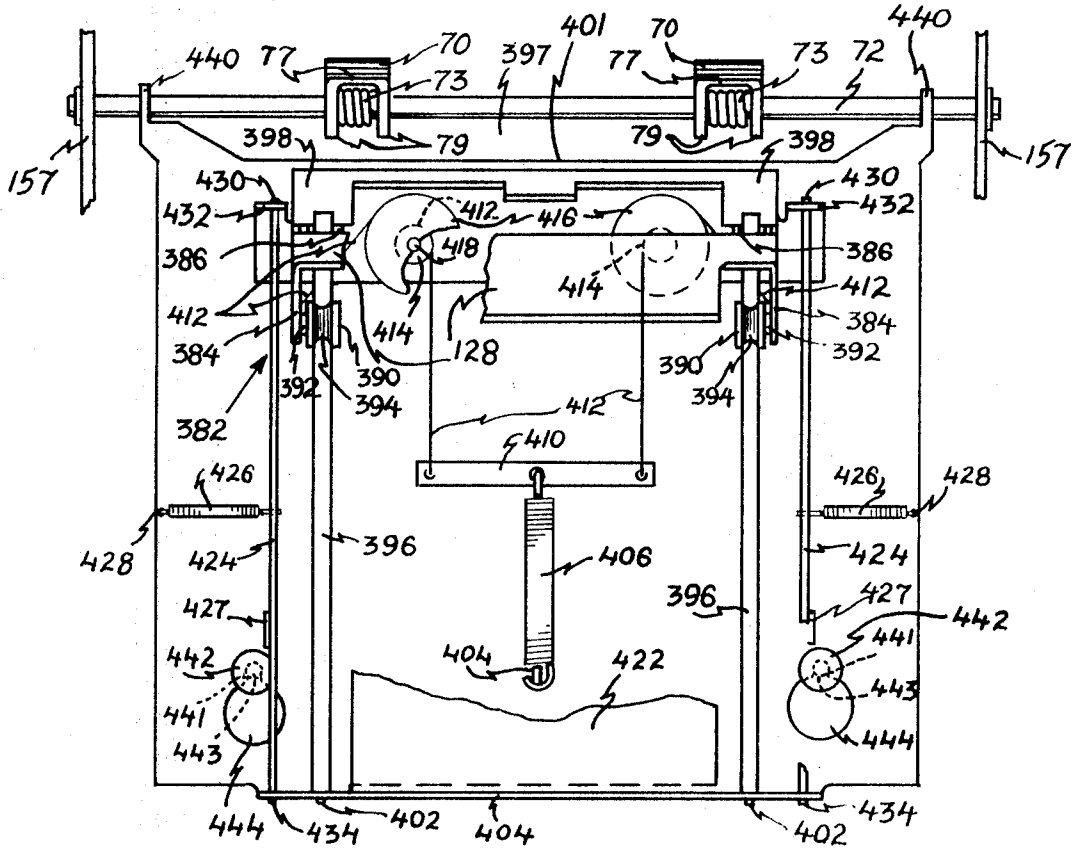


Fig 8

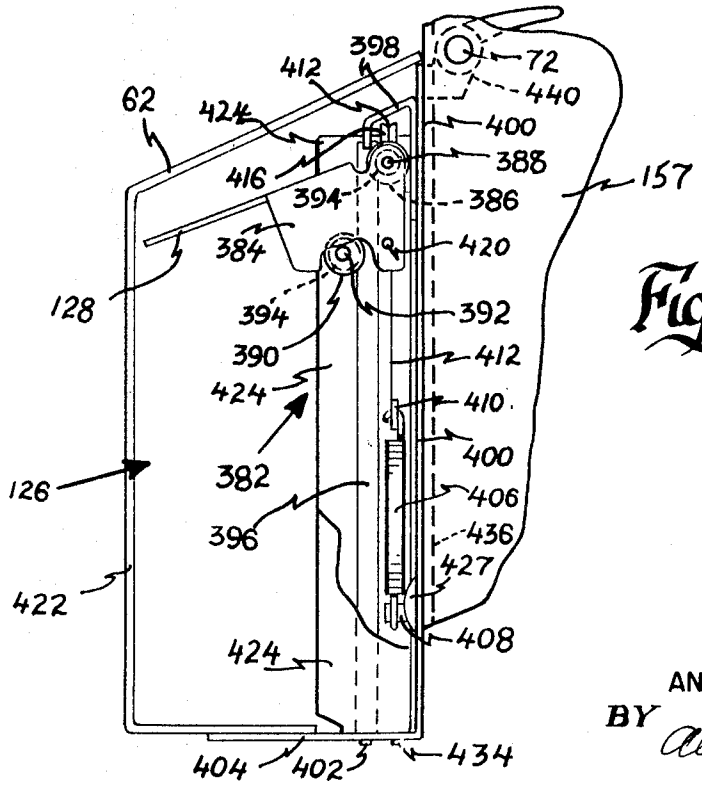


Fig 9

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Fig 10

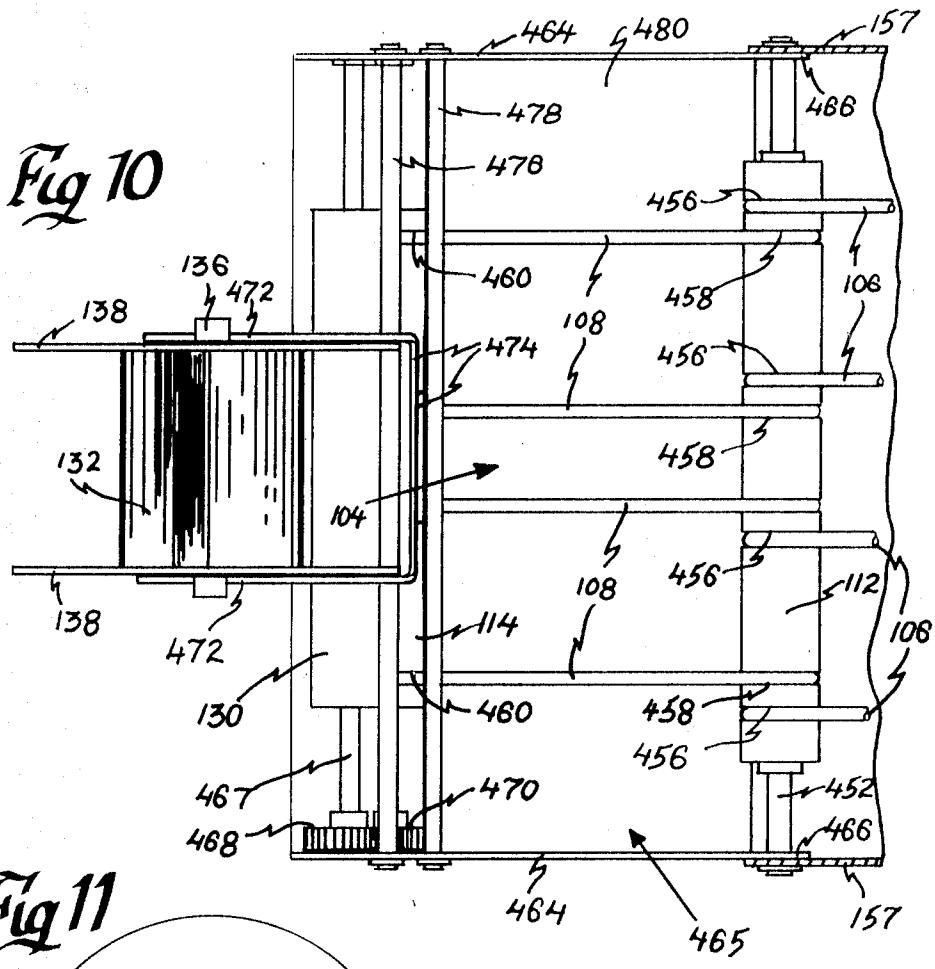
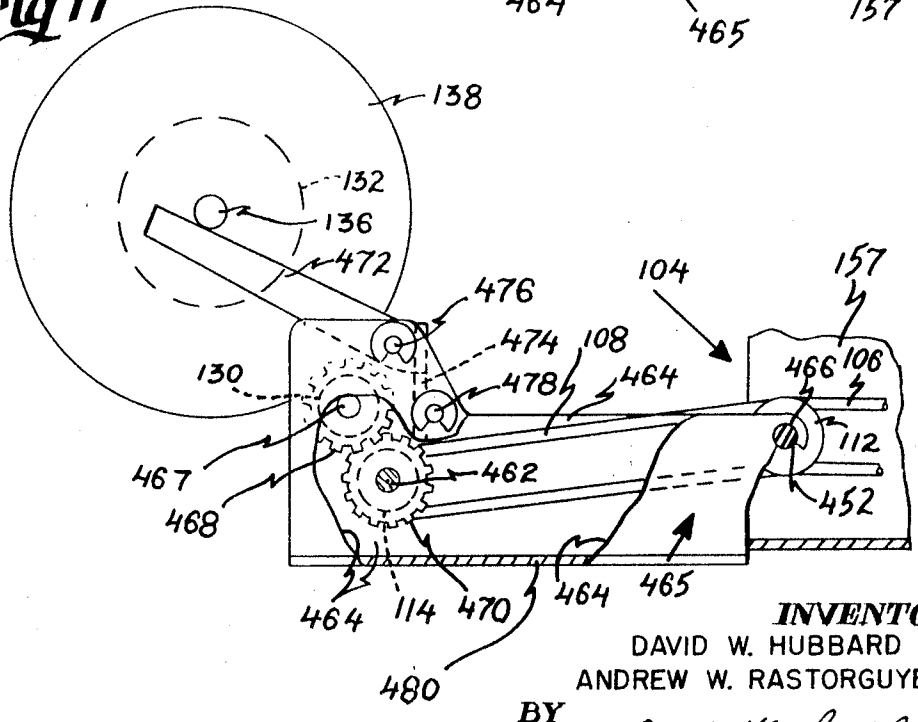


Fig 11



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Fig 12

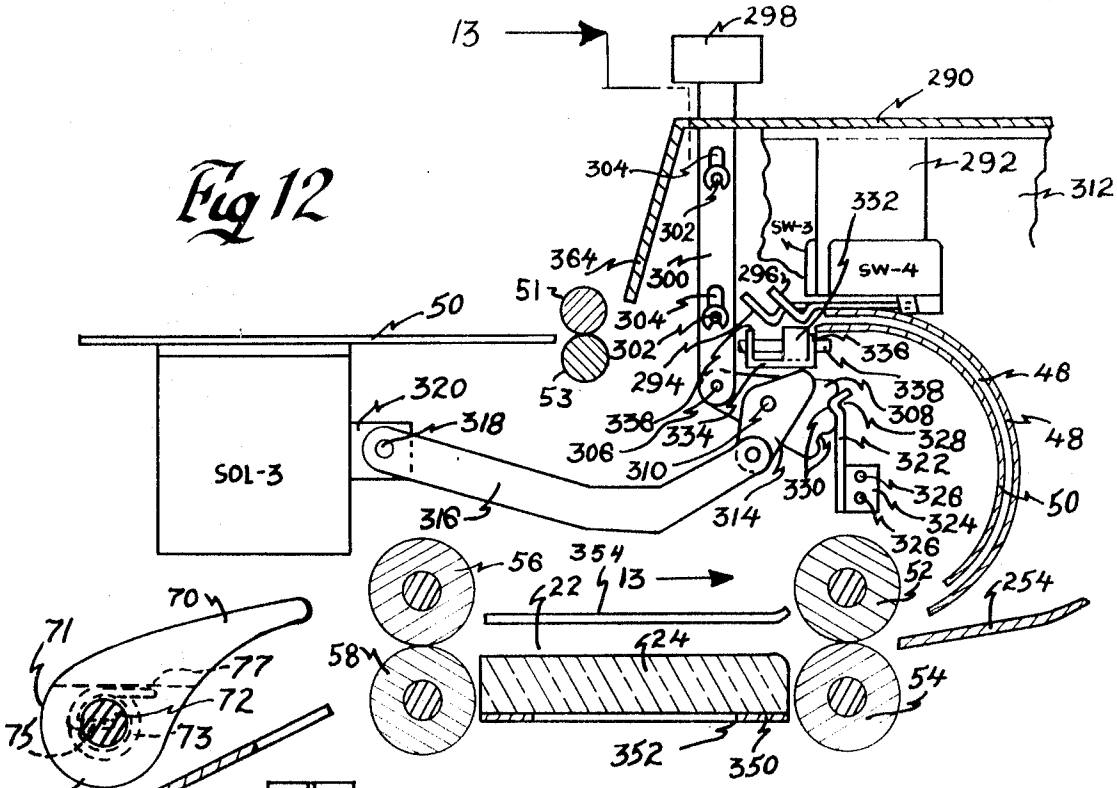


Fig 13

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Fig 14

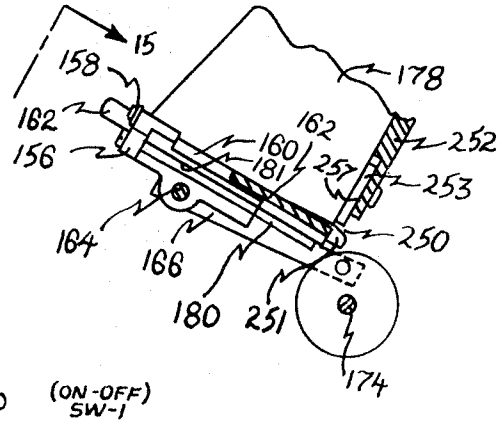


Fig 15

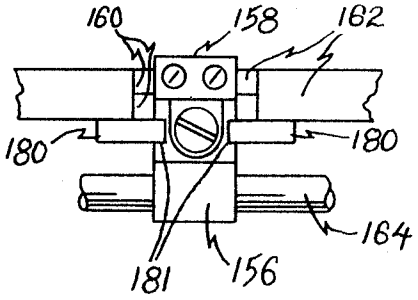
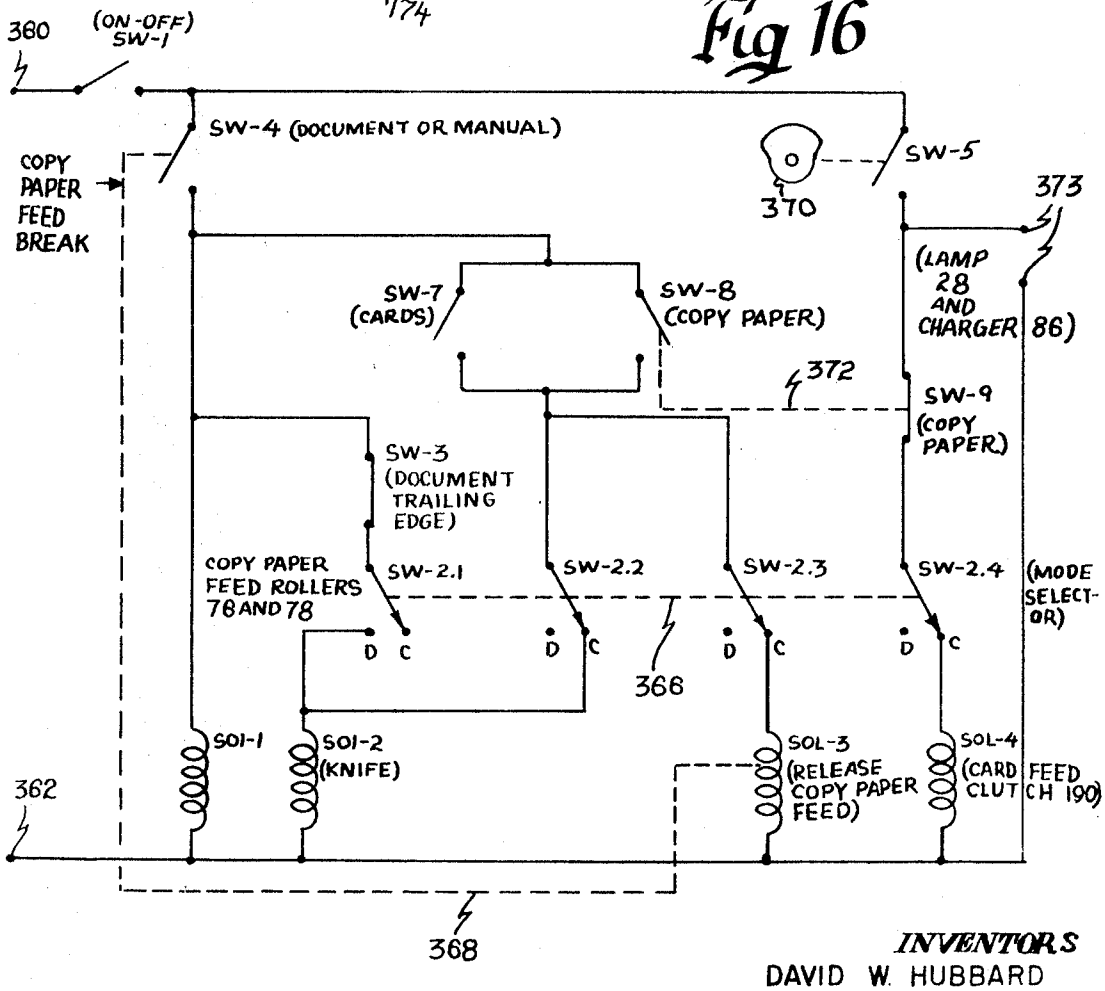


Fig 16



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LABEL-MAKING SYSTEM

FIELD OF THE INVENTION

The invention relates generally to the field of high-speed automatic labelling, and particularly concerns the photocopying of tabulating cards to produce mailing lists and labels.

THE PRIOR ART

At the present time, the best known technique for rapid and automatic mail addressing is subject to a number of severe disadvantages. This technique involves the use of a printing press to make a series of labels, each one including the name and address of one of the intended recipients. The printing presses which are used for this purpose require a set of individual address plates on which the printed material is represented by raised characters. Such plates have to be made of relatively heavy guage metallic material in order to withstand the printing impressions to which they are subjected. Consequently, a full set of printing plates, each one representing one address in a high volume mailing, is both heavy and bulky, the raised characters contributing substantially to the bulk.

Another disadvantage of these plates is that they are fairly expensive to produce. Therefore economic considerations normally dictate that they be stored after use. But storage can be a considerable problem, in view of the bulk and weight involved. In addition, the plates are somewhat vulnerable to bending and to damage which may be inflicted on the raised characters. Therefore transportation to a storage location must be done with a fair amount of care, this adding to the burden.

Still another disadvantage of such plates is that the printing ink which adheres to them must be washed off after each use.

Finally, the mechanism by which such plates are passed through the printing press is complex, yet must withstand the loads imposed thereon by the weight of the plates. Therefore the mechanism is subject to breakdown, and also is too noisy for ordinary office use.

SUMMARY AND OBJECTS OF THE INVENTION

The present invention avoids all these problems, but without sacrificing the advantages of rapid and automatic operation. The solution is to take the name and address information from a deck of flat, light weight record cards of a flexible material; for example conventional tabulating cards. The advantages of this approach are numerous. The tabulating cards have utility for other than printing purposes. In most cases, a deck of tabulating cards with legible name and address information printed thereon, and with the same and other information also recorded thereon in punch code, is already maintained for various business purposes. This deck now takes on the additional function of acting occasionally as a set of printing masters for mailing labels. Thus, no additional storage space is required. Secondly, tabulating cards are flat instead of three-dimensional, and they are light and flexible. Therefore they take up less room than printing plates, they are easier to handle, they are less vulnerable, they are inexpensively replaced when damaged or outdated, and the apparatus required for handling such cards is not as complex and not subject to the same operating loads as a printing press. Furthermore, a deck of tabulating cards is normally maintained in alphabetical or some other logical order, and the order can be changed or cards selected out as required by means of conventional tabulating equipment. Such flexibility and ease of handling are not available with printing plates.

Accordingly, the objective of this invention may be broadly stated as the provision of new equipment to be used for high volume mail addressing and the like. In more specific terms, the objects of the invention are to avoid printing plates and presses, with all the weight, bulk vulnerability, expense, mess, noise, breakdowns, inconvenience and problems of transportation and storage which they entail; and to use instead tabulating cards which have utility apart from mail labeling, which are light, flat, flexible, inexpensive to prepare and replace, clean, quiet, convenient to use and revise, and which pose no particular transportation or storage problems.

It is also an object to copy these tabulating cards by means of a photocopying machine which is quiet enough for an ordinary office, trouble-free, useable by general-purpose clerical personnel, and has all the conventional document copying capabilities of such machines. Another object is to modify an existing photocopying machine so as to provide additional card copying and label making capabilites with minimal engineering changes and at a minimal additional cost. Another object is to provide two entirely different operating modes; i.e. single documents and continuous card copying.

One form of the invention employs a plurality of record cards formed of flexible sheet material, each card having an address recorded thereon. The address may be recorded either in legible form suitable for photocopying, or in magnetic ink, punch code, or some other form readable by data processing equipment. Then a photocopying machine, or suitable data processing equipment which reads magnetic ink, punch code or the like and which has a printout capability, reads the record cards sequentially, scans each address in turn, and prints the addresses sequentially. Another part of the mechanism feeds sheet material for successive labels sequentially through the printing means; the printed addresses being thereafter applied to respective pieces of mail.

In the preferred form of the invention, the copying machine employed is a dual purpose device which can operate either in the conventional document copying mode or for rapid sequential copying of a deck of data cards. In the document mode the output of such a machine consists of discrete photocopies, and in the card mode it is preferably a continuous strip of copy paper with successive mailing label information distributed along the length thereof. This continuous strip is reeled up as it emerges from the photocopying machine, and later put into a conventional labeling machine of the type originally designed to accept the same type of continuous strip output from address label printing presses. The labeling machinery operates by severing the strip into discrete labels and gluing these sequentially to respective pieces of mail.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a sectional view, taken along a vertical plane, of a photocopying machine in accordance with the present invention, which is designed for conventional single document copying as well as for sequential copying of tabulating cards.

FIG. 2 illustrates a typical segment of a continuous strip output from the photocopying machine of FIG. 1 when operated in the card copying mode. The strip has a series of mailing address labels distributed along the length thereof.

FIG. 3 represents a typical piece of mail to which one of the address labels has been applied, after being severed from the continuous strip of FIG. 2.

FIG. 4 is a side elevational view, with parts broken away for clarity of illustration, of the tabulating card supply hopper and card feed mechanism of the machine of FIG. 1.

FIG. 5 is a top plan view, taken along the lines 5–5 of FIG. 4, showing additional details of the tabulating card supply hopper and feed mechanism.

FIG. 6 is a fragmentary sectional view, taken along the lines 6–6 of FIG. 7 looking in the direction of the arrows, and with parts broken away for clarity of illustration, of the solenoid-operated clutch for driving and tabulating card feed mechanism of FIGS. 4 and 5.

FIG. 7 is a fragmentary sectional view, taken along the lines 7–7 of FIG. 5, looking in the direction of the arrows, showing additional details of the tabulating card feed and clutch mechanism of FIGS. 4 through 6.

FIG. 8 a a front elevational view, with parts broken away for clarity of illustration, of the tabulating card output bin of the machine of FIG. 1.

FIG. 9 is a side elevational view, with parts broken away for clarity of illustration, of the same bin.

FIG. 10 is a top plan view of a portion of the machine of FIG. 1, showing the output mechanism to which the continuous address label output strip and the discrete document copies are both delivered.

FIG. 11 is a side elevational view, with parts broken away for clarity of illustration, of the output mechanism of FIG. 10.

FIG. 12 is a vertical section of a portion of the photocopying machine of FIG. 1, showing details of the feed control mechanism and the copying station thereof, through which either single documents or a stream of tabulating cards may be passed.

FIG. 13 is a sectional view, taken along the lines 13–13 of FIG. 12, looking in the direction of the arrows, of a portion of the feed control mechanism of FIG. 12.

FIG. 14 is a sectional view, taken along the lines 14–14 of FIG. 5, looking in the direction of the arrows, showing the card picker mechanism of FIGS. 4 and 5.

FIG. 15 is an elevational view of a portion of the same card picker mechanism, taken along the plan 15 of FIG. 14, looking in the direction of the arrow.

FIG. 16 is a schematic electrical circuit diagram revealing the control logic of the machine of FIG. 1, which enables it to function either as a conventional single document copier or as a sequential tabulating card copier in accordance with this invention.

The same reference characters refer to the same elements throughout the several views of the drawing.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

FIG. 1 shows the overall construction of a photocopying machine 20 which is designed for the performance of two alternative functions, as the need may appear. On the one hand it is capable of rapid automatic sequential copying of tabulating cards in order to prepare a continuous strip of mailing address labels, and on the other hand it is operable for conventional single document copying.

In general terms, the document capability resides in conventional copying mechanism including a copying station 22 at which a document is passed over a transparent plate 24 to be scanned by the beam 26 of a copying lamp 28. The light is reflected back from the document as a beam 30 toward a mirror 32 which redirects the light as a beam 34. The latter is focused by a lens 36 upon a strip of copying paper 40 within a printing station 38.

When the machine is operated in the document mode, one document at a time is manually inserted into a feed channel 46 formed between upper and lower plates 48 and 50 and deflector plate 254. Manual insertion causes the document to be fed around the bend of the channel 46 by rollers 51 and 53, (FIG. 12) until it is gripped between a pair of motor driven feed rollers 52 and 54, which then convey the document through the copying station 22. Subsequently another pair of motor driven feed rollers 56 and 58 convey the document out of the copying station.

A special receiving tray 60 (shown detached from the machine 20) is assembled therewith when the machine is to be used in the document mode. Such assembly is accomplished by placing the document tray 60 over a sloping surface 62 at the front of the machine. In this position a rear flange 64 hooks over the rear edge 66 of the sloped member 62 to secure the tray in place. The flange 64 also abuts eccentrically against a pair of gating members 70, rotating the gates downwardly about their shaft 72 to the dotted line position of FIG. 1. When so positioned, the gating members 70 divert the original document upwardly as it emerges from between the feed rollers 56 and 58, so that it is deposited in the document tray 60. A restraining lip 74 at the front of the document tray 60 retains the original document therein.

When operating in the document mode, the machine 20 automatically cuts the copies to the length of the original documents. Copy paper 40 is taken, by means of a pair of feed rollers 76 and 78, from a supply roller 42 wound upon a spool 44, which is rotatably mounted upon a shaft 47. The rollers 76 and 78 are motor driven by means of a conventional clutch (not shown) which is engaged during the time it takes for the original document to pass a length sensing switch SW–4 adjacent the channel 46. From rollers 76 and 78, the copy paper passes through a cutoff knife mechanism 80 to another pair of motor driven feed rollers 82 and 84. After a length of copy paper equal to the length of the original document has been fed past the cutoff knife mechanism 80, another switch SW–3 located adjacent the channel 46 senses the trailing edge of the document and energizes a circuit to actuate the knife mechanism 80, thus cutting the copy paper to the proper length.

The photocopier 20 could be any known type, but is preferably an electrostatic machine of the kind which has become common in recent years. As such, it includes an electrostatic charging mechanism 86 through which the copy paper is fed by the rollers 82 and 84. Upon emerging from the charging mechanism and passing through the image station 38, the copy paper is gripped by another pair of motor driven feed rollers 92 and 94, and fed into a conventional toner solution contained within a reservoir 96. Upon emerging from the toner reservoir it is fed by another pair of motor driven rollers 98 and 100 to a drying station 102. The copy paper is conveyed through the drying station and toward an exit 104 by means of belts 106 and 108 and the rotating rollers 110, 112 and 114. The finished copy may then be manually removed from exit 104.

The mechanism thus generally described is conventionally housed in a cabinet comprising a rear panel 21, top panel 23, floor panel 25, and front panel 436. The cabinet stands above table-top level on feet 27, and has within it various internal partitions 29.

In accordance with this invention, when the machine 20 is operated in the card copying mode, the document tray 60 is detached, allowing the gating members 70 to return under spring bias to their raised positions, illustrated by the solid lines of FIG. 1. The material to be copied is a conventional deck of tabulating cards 116 fed from a hopper 120 mounted atop the machine 20. Motor driven rollers 122 and 124 cooperate to feed successive cards into a throat formed by the plate 50 and the deflector plate 254 immediately in front of the rollers 52 and 54. The latter rollers then pass each card in succession through the copying station 22, from which they are withdrawn by the rollers 56 and 58. Thus, as an example of the way in which the card copying operation takes advantage of the existing photocopying mechanism, the cards are ultimately conveyed through the copying station by the same feed mechanism as are the documents when the machine is in the other operating mode.

The upper position of the gate member 70 causes each of the cards emerging from the copying station to be diverted downwardly through a passageway 379 into an output bin 126, where they are collected upon a vertically movable card catcher tray 128. During operation the tray 128 sinks lower to accommodate the increasing accumulation of tabulating cards thereon.

In the card copying mode the cutoff knife mechanism 80 is disabled, and a narrow strip of copy paper 41 (narrower than the document size copy paper 40) is unreeled in a continuous strip from a supply roll 43 which is wound on a spool 45 rotatably supported on the shaft 47. The narrow strip 41 traverses the same path described above for the wider strip 40, up to the point where they both emerge from the cabinet at exit 104. Beyond that point, the narrow output strip 41 (which has not been severed into discrete copies as is the wide strip 40) passes around a motor driven feed roller 130 and is wound upon a takeup reel 132, to form an output roll 134. The takeup reel 132 is driven by a shaft 136 which in turn is

rotated by a pair of large circular rims 138 in frictional driving engagement with the motor driven roller 130.

A representative segment of the continuous output strip 41, as it looks when torn from the roll 134, is shown in FIG. 2. There it is seen that the card copying output strip 41 has successive name and address blocks 138 distributed along the length thereof, each one defining a label 142. Such an output roll 134 may then be used as the input to a conventional mail labeling machine of the kind now commercially available. (Such machines were originally designed to take a similar output strip from a conventional address label printing press.) The labeling machinery severs the individual labels 142 from each other along the dashed lines 139, applies a suitable adhesive material to the back of each label, and presses the glued labels into adhesive relationship with respective pieces of mail 144 (see FIG. 3).

FIGS. 4 through 7 provide a more detailed view of the tabulating card supply hopper 120 and the mechanism for delivering a continuous stream of cards from that hopper to the copying station 22. The machine 20 has a main drive motor, not shown, which is connected to drive all the feed rollers 56 and 58, 52 and 54, 122 and 124, 76 and 78, 82 and 84, 88 and 90, 92 and 94, 98 and 100, and the conveyor belt roller 110, either directly or indirectly from a common drive chain 150. This type of drive is presently conventional in electrostatic photocopying machines of the kind modified for the purposes of this invention. For driving the feed rollers 122 and 124, which insert the tabulating cards 116 into the nip of rollers 52 and 54, the chain 150 engages a sprocket wheel 152 affixed to shaft 154 which is journaled in a vertical panel 157 of the machine 20 by means of a bushing 159. The shaft 154 drives a gear 186 secured thereto, which in turn drives a gear 182 which rotates on a shaft 183 protruding from a lug 184 formed in one sidewall 178 of hopper 120. Gear 182 in turn drives a gear 176 secured to a lower roller shaft 174, which is journaled in both hopper sidewalls 178 and has two lower card feed rollers 124 secured thereto. Shaft 174 also has a gear wheel 168 secured thereto for driving a gear 169 secured to an upper roller shaft 171 which has two upper card feed rollers 122 secured thereto. Each upper roller 122 is paired with one of the lower rollers 124 for gripping and feeding successive tabulating cards 116.

In order to deliver successive tabulating cards 116 to the feed rollers 122 and 124, there is employed a pair of card pickers 156 of the kind which is common in card handling machinery. As best seen in FIGS. 14 and 15, each card picker 156 has a card-engaging member 158 which protrudes slightly less than the thickness of a tabulating card above the top surface of the picker so as to engage a single tabulating card 116, i.e. the bottom one in the hopper 120. In order to reach the bottom card, the pickers 156 ride in access slots 160 which are formed in the floor 162 of the card supply hopper 120. The pickers 156 are reciprocated longitudinally within these slots, as indicated by arrows 162, FIG. 5, by means of a carrier shaft 166 164 engaging the opposite ends of a carrier shaft 164. On each forward stroke of the pickers 156 (i.e. in the downward direction as viewed in FIG. 4) the members 158 catch a tabulating card 116 and deliver it to the feed rollers 122 and 124. On each return stroke (upward in FIG. 4) the pickers return to their initial position so that the members 158 can engage the next tabulating card 116 and repeat the operation.

The drive links 166 are made to perform their reciprocating motion by means of respective crank wheels, the gear wheel 168 and another wheel 170, to which they are eccentrically connected by pins 172. The crank wheels 168 and 170 are secured to opposite ends of the lower roller shaft 174. Thus the drive to shaft 174 not only is imparted to rollers 124, and via gear 169 to rollers 122, but also serves to reciprocate the links 166 and the card pickers 156. The motion of the card pickers 156 is guided in a linear direction notwithstanding the cranking of the links 166, by pairs of side rails 180 which are secured to the lower surface of the hopper floor 162 and which extend laterally into sliding engagement with slots 181 formed in the card pickers 156.

In order to interrupt the delivery of cards 116 by stopping the card feed rollers 122 and 124 and the card pickers 156, there is provided a clutch mechanism 190 (FIGS. 6 and 7) controlled by a solenoid SOL–4 secured to a bracket 192 mounted upon one of the hopper side panels 178. The gear 176 is continuously driven, but is not continuously connected to the shaft 174. Instead, the gear 176 is secured to a cylindrical drive hub 194 which is rotatable relative to the shaft 174. The drive hub 194 in turn may be drivingly engaged with or disengaged from a driven hub 196 on the shaft 174 which is continuously connected to that shaft by means of a pin 198. In order to accomplish the engaging and disengaging function, the clutch 190 comprises a coil spring 200 which surrounds both hubs 194 and 196, and is normally wound sufficiently tightly thereon so that the coil spring clasps them both and drivingly connects the two hubs together. Under these conditions, the continuously driven gear 176 and its hub 194 transmit power via the clutching spring 200, hub 196 and pin 198 to the lower shaft 174. The shaft then drives the lower rollers 124 and the wheels 170 and 168, which actuate the links 166 to drive the card pickers 156, and wheel 168 also drives the gear 169 to rotate the upper shaft 171 and rollers 122.

One of the rollers 124, seen at the right in FIG. 5 is affixed directly to the shaft 174, while the other, as seen in FIGS. 6 and 7, is mounted upon the driven hub 196 and drivingly secured thereto by means of a fastener 202. The fastener secures an eccentric arm 204 of the hub 196 to the central disc of the roller 124, and also anchors the adjacent end 206 to the clutching spring 200.

In order to disengage the clutch 190, the free end 208 of the spring 200 is engaged by a blocking member 210 which is mounted upon a shaft 212 journaled within a bushing 214 secured to the hopper side panel 178. The driving direction of the mechanism is clockwise, as indicated by arrow 216 in FIG. 7. When the driving hub 194 attempts to rotate the clutching spring 200 in that direction, the blocking member 210 engages the spring end 208 and blocks rotation of the clutching spring 200. To the extent that the clutching spring 200 can be rotated by the drive hub 194, it only serves to turn the spring 200 in the uncoiling direction relative to the blocked end 208, thus releasing the clutching engagement of the spring 200.

When it is necessary to release the spring end 208 and engage the clutch 190, the blocking member 210 is moved to the left relative to the view of FIG. 7 to remove it from blocking relationship with the spring end 208. This is accomplished by rotating the blocking member shaft 212 clockwise by means of a control link 218 secured thereto. The control link in turn is pivotally connected by means of a pin 220 to a connecting link 222 which functions by pulling upwardly upon the pivot pin 220 to produce clockwise rotation of the link 218. The connecting link in turn is actuated by the armature 224 of solenoid SOL–4, to which it is connected by means of a pivot pin 226.

So long as the solenoid SOL–4 is energized, its armature 224 is attracted upwardly to lift the connecting link 222 and rotate control link 218 and shaft 212 clockwise, thereby preventing the blocking element 210 from interfering with spring end 208. Under these circumstances the clockwise torque exerted on clutching spring 200 by the drive hub 194 tends to tighten the spring against the hubs 194 and 196 for a driving connection therebetween. The clutch 190 is then engaged, to complete the drive train to the card pickers 156 and the feed rollers 122 and 124.

When the solenoid SOL–4 is deenergized, its armature 224 is lowered under spring bias, driving connecting link 222 down to rotate control link 218 and shaft 212 counterclockwise. This returns blocking element 210 to the position in which it interferes with the spring end 208. Then, as soon as the clutching spring 200 completes its current revolution and comes into position for the spring end 208 to reengage the blocking element 210, the clutch 190 is disengaged.

In order to bring the feed rollers 122 and 124 and the card pickers 156 to an immediate halt and insure that the pickers do not stop at an indefinite position after disengagement of the

clutch 190, there is provided a stop member 230 secured by means of a pivot pin 232 to the underside of the hopper floor 162. This stop member is normally rotated clockwise about its pivot pin, as seen in the view of FIG. 6, by means of a biasing spring 234. One end of the spring is hooked through an aperture 236 at one end of the stop member 230, and the other end of the spring is hooked around a pin 238 protruding downwardly from the lower surface of the hopper floor 162. When in its biased position, the stop 230 interposes its free end in the path of rotation of a cooperating stop element 240 which is secured to the central web of the nearby roller 124 by means of a fastener 242. The roller 124 rotates clockwise relative to FIG. 7 until the element 240 strikes the member 230 to provide a positive stop. This halts one of the rollers 124 and, because of their mutual connection to shaft 174, also stops the other roller 124, the upper rollers 122, and the card pickers 156. This causes the entire card feed mechanism to stop in a known position, and also cuts off the card feed abruptly and precisely.

In the blocking position of stop 230, its biased rotation about the pivot pin 232 is limited by the blocking member 210 to prevent the member 230 from rotating past element 240. When the solenoid SOL–4 engages the clutch 190, the motion of blocking element 210 to the left relative to FIGS. 6 and 7 rotates stop 230 counterclockwise against the urging of its biasing spring 234, so as to remove the stop from blocking engagement with element 240, thereby releasing card pickers 156 and the feed rollers 122 and 124 for a resumption of card feed. When the solenoid SOL–4 is later deenergized to disengage clutch 190, the return of blocking element 210 to its initial position allows the stop 230 to return under spring bias to its operative position. Then at the conclusion of the current revolution of the nearby roller 124, element 240 once again engages the stop 230.

When the clutch 190 is engaged, the pickers 156 slide each successive tabulating card 116 across the hopper floor 162 and through an exit space 250 between the hopper floor and the lower end of a hopper rear wall 252. The size of the exit space 250 is adjustable, by means of elements 251 and 253, (FIG. 14) to admit no more than one tabulating card 116 for each picker cycle. The element 251 is adjustable forwardly and rearwardly within a channel 255 (FIG. 5) formed in the hopper floor 162, and cooperates with the element 253 which is adjustable up and down in a channel 257 (FIG. 14) formed in the hopper wall 252.

Each tabulating card 116 as it emerges from the exit space 250 is gripped between the pairs of card feed rollers 122 and 124, and thereby fed across a plate 254 which guides the cards into the grip of feed rollers 52 and 54, which deliver all material to be copied, documents and tabulating cards alike, to the copying station 22.

FIGS. 4 and 5 show the guide plate 254 is formed with a first pair of lugs 256 at opposite sides thereof which are secured to respective hopper side panels 178 by means of pins 258, which permit the guide plate to pivot relative to the card hopper 120. In addition, the guide plate is provided with two further depending lugs 260 at opposite sides thereof which are pivotally connected by means of pins 262 to the copying machine sidewalls 157. Finally, the hopper sidewalls 178 are also provided with depending lugs 264 and bushings 265 by means of which the entire card hopper 120 is pivotally mounted upon a shaft 266, which in turn is supported by bushings 268 upon the copying machine sidewalls 157.

The hopper's downward movement is limited by a pair of depending lugs 270, one of which is visible in FIG. 4, which strike against a shaft 272 supported between the copying machine side panels 157. Shaft 272 is so positioned that the hopper floor 162 is inclined to the right as seen in FIGS. 4 and 7 to facilitate the exit of tabulating cards 116 through the space 250. The front of the hopper 120 has a pair of short posts 274 (FIGS. 1 and 4) which serve only to align the lower tabulating cards in the deck 116, and are not required to retain the upper cards within the hopper 120.

Below the hopper floor 162 is a switch SW–7 (FIGS. 1 and 5) having a feeler arm 280 which protrudes up through an aperture 282 in the hopper floor 162 in order to sense the tabulating card deck 116. As long as cards are present to depress the switch plunger 280, the electrical control circuit (FIG. 16) is advised that the tabulating cards are available in the hopper 120 to be copied. A heavy metal card follower weight 117 (FIG. 1) keeps the cards flat for engagement with the pickers 156, and for actuation of the switch SW–7 even when only one card remains in the hopper. Weight 117 however has the usual relief (not shown) to prevent it along from actuating the switch when the cards are exhausted. Under those circumstances cards no longer depress the switch plunger 280 and the control circuit is advised that the card copying operation has been completed. The switch SW–7 also appears schematically in the electrical circuit of FIG. 16, where it is revealed as one of the elements controlling the circuit for energizing a solenoid SOL–2 which operates the copy paper cutoff knife mechanism 80. As is described more fully below, one of the conditions for severing the copy paper strip 40 is completion of the tabulating card deck 116; hence the connection of the card sensing switch SW–7 to the cutoff knife solenoid SOL–2.

Now that the mechanism for supplying successive tabulating cards 116 to the copying station 22 has been described, we turn our attention to FIGS. 12 and 13 for a description of the copy paper feed control, so that the dual capability of the machine 20 may be more fully understood. There it is seen that the document sensing switches SW–3 and SW–4 are suspended from a top panel 290 by means of an inverted U-shaped bracket 292. These switches have respective feeler arms 294 and 296 which extend downwardly into the document channel 46. In the document mode, feeler arm 296 closes switch SW–4 to energize a solenoid SOL–1 (FIG. 16) over the entire length of the document inserted into channel 46. Solenoid SOL–1 then engages a conventional clutch (not shown) for driving the copy paper feed rollers 76 and 78 during the time that it takes the original document to pass the feller 296. As a result, the feed rollers are made to unreel a length of copy paper 40 equal to the length of the original document being copied. Then when the trailing edge of the original document passes feeler 294, the latter closes switch SW–3 to energize the cutoff knife solenoid SOL–2 (see also FIG. 16). In this way the copy paper 40 is cut to the length of the original document. Such operation assumes of course that a four-ganged switch SW–2, Which is the mode selector, is transferred to the left relative to FIG. 16, so as to select the document mode.

For card copying, the machine and the electrical control circuit operate quite differently. The mode selector switch SW–2 is transferred to the right relative to FIG. 16, and the feed button 298 (FIGS. 12 and 13) is manually depressed to drive downwardly a feed lever 300 mounted for vertical movement upon a vertical panel 312 by pins 302 engaging vertical slots 304 formed in the panel 312 by pins 302 engaging vertical slots 304 formed in the lever. The lever is connected by means of a pivot pin 306 to a rotatable segment 308 pivotally mounted upon a shaft 310 journaled in the panel 312. The downward motion of the feed lever rotates the shaft 310 counterclockwise relative to the view of FIG. 12. At the opposite end of the shaft is secured a link 314 by which the shaft may be rotated clockwise under control of a pair of parallel links 316 connected by a pivot pin 318 to the armature 320 of a feed break solenoid SOL–3 (see also FIG. 16).

A detenting leaf spring 322 is secured to the panel 312 by means of a bracket 324 and suitable fasteners 326. The detenting spring is bent to form a projection 328 which bears against an arcuate edge of the member 308 and engages either of two detents 330 formed therein to hold the segment 308 in either of two position.

The position illustrated in FIGS. 12 and 13 is the one assumed by the segment when the copying machine 20 is in the document mode. Under these circumstances the feeler 296 of

switch SW–4 is not engaged by an actuator 334 connected by a pair of upstanding lugs 336 and a pin 338 to a pair of upstanding lugs 340 bent from a bracket 342. The bracket 342 is formed with downwardly bent lugs 344 at either end thereof which receive the shaft 310. So long as the element just described are in the illustrated document mode position, the switch SW–4 operates the feed roller clutch solenoid SOL–1 only when the feller arm 296 is actuated by a document.

But when the feed button 298 is manually depressed to drive lever 300 downwardly, segment 308 is rotated counterclockwise, relative to the view of FIG. 12, and is thereby shifted to the other dented position. This rotation of segment 308 turns shaft 310, so that a lug 332 bent upwardly from the end of the actuator 334 and situated eccentrically of the shaft 310 is then raised by member 314 to engage the feeler arm 296 of switch SW–4. As a result, switch SW–4 is closed to energize the solenoid SOL–1, which engages the drive to the copy paper feed rollers 76 and 78 for card copying operation. The detenting spring 322 holds the actuator 334 in this position to keep the switch SW–4 closed throughout a card copying operation. In this use of the same switch SW–4 to control the paper feed for card mode as well as document mode operation, we again see how a conventional single purpose photocopier has been adapted to do double duty as a card copier.

During such operation cards which are delivered sequentially across the guide plate 245 by the card feed rollers 122 and 124 are then gripped between the same rollers 52 and 54 which in the document mode serve to extract the original document from channel 46. These rollers then feed each card in turn across the transparent plate 24 of the copying station 22. The plate 24 is made of glass and is supported upon a metal plate 350 having an aperture 352 therein to admit the light beam 26 from the lamp 28 (FIG. 1). A roof plate 354 cooperates with the glass plate 24 to define the channel through which the copied material passes.

A subsequent set of feed rollers 56 and 58 extracts the copied material, either a document or a sequence of tabulating cards, from the copying station 22 and ejects it to the left relative to the view of FIG. 12. When the machine is in the card mode, the gates 70 are in the position illustrated in FIG. 12 and by the solid lines of FIG. 1. In this position they direct the emerging tabulating cards downwardly across a guide plate 356 and through passageway 379 into the output bin 126. Alternatively, when the machine 20 is operating in the document mode, the tray 60 is put in place over the panel 62, and flange 64 strikes the gates 70 at a location 71 above the center of shaft 72, causing the gates to rotate downwardly as shown by the dashed lines of FIG. 1. This in turn causes the documents emerging from between the rollers 56 and 58 to be deflected across the top surface of the gates so that they fall into the tray 60. When the tray 60 is removed, the gates spring back up to the card position under the influence of respective biasing springs 73 which are coiled about shaft 72. One end of each spring is anchored within an opening 75 in the shaft, and the other end presses upwardly against a flat 77 formed centrally of the gates 70 above a bifurcation defined by a pair of spaced hubs 79 (see FIG. 8). The biasing springs are laterally contained within this bifurcation.

In order to minimize the blank space between consecutive mailing address labels printed on the output strip 41, the card feed rollers 122 and 124 run at higher linear speed than the feed rollers 52 and 54. As a result, during the interval when one tabulating card 116 has slowed down to the speed dictated by rollers 52 and 54 and the following tabulating card is still being conveyed at the faster speed dictated by the rollers 122 and 124, the second tabulating card catches up with the first one to some extent and thus overlaps it. Consequently, successive tabulating cards 116 arrive at the copying station 22 in an overlapping relationship reminiscent of shingles on a roof. This causes the consecutive address labels 138 to be printed closer together upon the copy strip 41.

Whenever conditions call for an automatic termination of the card copying mode, the solenoid SOL–3 is energized. This causes it to retract its armature 320 and pull the parallel connecting links 316 to the left relative to the view of FIG. 12, so as to rotate the member 314 and shaft 310 clockwise. When so rotated, the shaft 310 retracts the lug 332 of actuator 334 from the switch feeler 296, to open switch SW–4 and terminate energization of the copy paper feed roller clutch solenoid SOL–1. At the same time, the shaft 310 rotates the segment 308 clockwise to return it to its original detented position, so that the mechanism remains out of the card mode until the next time that the feed button 298 is manually depressed.

The reader is now in a position to appreciate the electrical logic of FIG. 16. Switch SW–1 of FIG 16 turns the machine 20 on and off by controlling the AC supply from a pair of power input terminals 360 and 362. This switch is physically located on the front panel 364 of the machine 20 as seen in FIG. 1. Also located on that panel is switch SW–2 of FIG. 16, which is a double throw device used to select between the document and card copying modes of the machine 20. Electrically switch SW–2 comprises four individual switches SW–2.1 through SW–2.4 in ganged relationship (dashed line 366). Terminal D of each switch is the document mode terminal, and terminal C is the card mode terminal. Switches SW–3 and SW–4 of FIG. 16 are represented also in FIGS. 1, 12 and 13. In connection with the latter two figures it was explained that, in the document mode, switch SW–4 closes during the time that a document is fed past the feeler arm 296, as a means of detecting the length of the document, so as then to actuate the cutoff knife solenoid SOL–2 and sever a matching length of copy paper 40.

In contrast, when the machine operates in the card copying mode, switch SW–3 is cut out of the circuit by the mode selector switch SW–2 so as to disable the cutoff mechanism 80 to provide an output in the form of a continuous strip rather than discrete copies. Switch SW–4, on the other hand, is still needed to advance the copy paper 41, but is manually closed by the operating the feed button 298 and latched in that position by the detenting relationship between segment 308 and spring 322 of FIG. 12. Subsequently, when solenoid SOL–3 of FIGS. 12 and 16 is energized, the detenting segment 308 is shifted and the switch SW–4 is allowed to reopen (dashed line 368) to terminate card mode operation.

Solenoid SOL–3 is energized to accomplish this, when the selector switch SW–2 is in its card mode position, by either of two switches SW–7 and SW–8 of FIG. 16 which are electrically in parallel. Switch SW–7 is physically represented in FIGS. 1 and 5, where it is seen that is is positioned to sense the tabulating card deck 116. This switch closed when the tabulating card deck is exhausted, i.e. when the card copying run has been completed. Switch SW–8 is physically represented in FIG. 1 where it is seen positioned adjacent the copy strip 41 as it is unreeled from the supply roll 43. The feeler arm 371 of this switch senses the copy strip, and closes the switch when the strip is exhausted or is broken upstream from the feed rollers 76 and 78. Accordingly, in the card mode, when the copying of the tabulating card deck 116 is completed, or the copy paper strip 41 is exhausted or broken, the solenoid SOL–3 is energized to release the feed switch SW–4 and terminate the feeding of copy paper 41.

A further switch SW–5, which is represented only in the electrical diagram of FIG. 16, is mechanically operated by a suitably driven and timed cam 370 to provide time delay. This time delay relates to the document mode, and its purpose is to allow the leading and trailing edges of the copy paper strip 40 to travel from the point of cutoff by the knife mechanism 80 down to the printing station 38, and to allow the leading and trailing edges of the original document, after engaging the feeler arm 296 of switch SW–4, to travel through channel 46 to reach the copying station 22, before the copying lamp 28 and the electrostatic charging device 86 are turned on (for leading edges) or off (for trailing edges). For this reason, terminals 373 energized by the switch SW–5 are provided for connection to the lamp 28 and charger 86 (not shown in FIG.

16). Since the electrical connections to the lamp and charger and the mechanical time delay mechanism are all conventional equipment on copying machines which are now being marketed, it is unnecessary to illustrate or describe them in any greater detail.

In another example of the way in which the existing mechanism for copying documents is adapted for cards according to this invention, the same switch SW-5 is used also to control the card feed clutch solenoid SOL-4 in the card mode, so that the tabulating cards 116 are not fed from the card hopper 120 to the copying station 22 until the copying lamp 28 and the electrostatic charger 86 have been turned on to render the machine 20 operative for copying.

FInally, there is a switch SW-9 which is ganged (dashed line 372) with switch SW-8 of FIGS. 1 and 16. Switch SW-9 is in series with the card feed clutch solenoid SOL-4, and opens to disrupt the feeding of cards when the feeler arm 371 (FIG. 1) detects a break in the continuity of the copy paper strip 41. In the card mode, switch SW-9 acts immediately to deenergize the card feed clutch solenoid SOL-4 and stop the feeding of cards abruptly when the paper copy strip 41 is no longer available for copying them. This immediate card feed cutoff makes it unnecessary to wait for switch SW-8 to produce a delayed deenergization of solenoid SOL-4 via dashed line 368, and switch SW-4.

A typical sequence of operations of the machine 20 will now be described in detail with reference to the electrical logic of FIG. 16. To begin with, the machine is turned on by closing switch SW-1 on the front panel 364. Let us assume that one or more documents are to be copied first. To set the machine 20 in the document copying mode, the selector switch SW-2 on front panel 364 is transferred to its D terminals of FIG. 16. As a result, switch SW-2.4 disables the branch of the circuit which includes switch SW-9, and the card feed clutch solenoid SOL-4, while switch SW-2.3 disables the copy paper feed release solenoid SOL-3. In addition switch SW-2.3 prevents the card sensing switch SW-7 and the copy paper sensing switch SW-8 from operating the knife solenoid SOL-2; instead, the switch SW-2.1 connects the knife solenoid SOL-2 to the document trailing edge sensing switch SW-3.

At this point the operator inserts a single document into the channel 46 until it is grabbed by the driven rollers 51 and 53. When the leading edge of the document contacts feeler 296, it closes switch SW-4 and thereby energizes the solenoid SOL-1 to clutch the drive chain 150 to the copy paper feed rollers 76 and 78, so that copy paper 40 is fed downwardly from these rollers starting at the time that the document leading edge passes the switch SW-4. Furthermore, the latter switch remains closed for the entire time it takes for the length of the original document to pass the switch feeler arm 296, so that feed rollers 76 and 78 continue to unreel a length of copy paper 40 equal to the length of the original document. Then when the trailing edge or the original document releases the feeler arm 296, switch SW-4 opens to deenergize solenoid SOL-1 and stop feeding copy paper 40. Also when the railing edge passes feeler arm 294, switch SW-3 closes and energizes solenoid SOL-2 to actuate the cutoff knife mechanism 80, severing the copy paper 40 to the length of the original document.

The time which it takes the leading edge of the original document to pass through the channel 46 from the switch SW-4 to the copying station 22 is equal to the time that it takes the leading edge of the copy paper strip 40 to pass from the point where it was last severed by the cutoff knife mechanism 80 down to the printing station 38. Similarly, the time that it takes the trailing edge of the original document to pass from the switch SW-3 through the copying station 22 is equal to the time that it takes the freshly severed trailing edge of the copy paper 40 to pass downwardly from the point where it was severed by the cutoff knife mechanism 80 and through the printing station 38.

While the machine 20 is in this operating mode, a plurality of document copies can be made only by repeating the process; i.e. an original document must be manually inserted into the channel 46 once for each copying cycle of the machine 20.

In contrast, in the card copying mode, the machine 20 is conditioned for a continuous copying run during which a steady stream of tabulating cards 116 are copied in succession, and the operation of the machine continues automatically in this manner until it is deliberately shut off or the tabulating cards 116 have all been copied, or the copy paper strip 41 is exhausted or suffers an accidental break.

In order to operate in the card copying mode, the operator fills the hopper 120 with the tabulating cards 116 and puts the card weight 117 over the deck. He also replaces the 8½ inch document width copy paper roll 42 upon the shaft 47 with a roll 43 containing the narrower width copy paper strip 41 which is suitable for address labels. Then the selector switch SW-2 is transferred to its card copying mode position. Switch SW-2.1 then takes control of the cutoff knife solenoid SOL-2 away from the document trailing edge sensing switch SW-3, switches SW-2.2 and 2.3 respectively give control over the cutoff knife solenoid SOL-2 and the copy paper feed release solenoid SOL-3 to the parallel combination of the card sensing switch SW-7 and the copy paper sensing switch SW-8, and switch SW-2.4 gives control over the card feed clutch solenoid SOL-4 to the copy paper sensing switch SW-9 and the time delay switch SW.5.

The operator then presses down the feed button 298 and its lever 300 for manual closure and locking of switch SW-4. That switch energizes the solenoid SOL-1 which engages a clutch to connect the copy paper feed rollers 76 and 78 to the main drive chain 150, so that the copy strip 41 is unreeled. At this moment the switch SW-5 is still open, and the card feed solenoid SOL-4 is still deenergized along with the copying lamp 28 and the electrostatic charger 86. After the passage of the time delay governed by SW-5 which is operated by cam 370, switch SW-5 then closes, turns on the copying lamp and charger, and energizes the card feed clutch solenoid SOL-4 through switches SW-9 and SW-2.4. Solenoid SOL-4 consequently engages clutch 190 to drive pickers 156 and feed rollers 122 and 124, which then begin delivering the tabulating cards 116 sequentially to the copying station 22. Operation in the card copying mode will then continue automatically in this manner so long as switches SW-7 and SW-8 are open and switch SW-9 is closed.

There are two alternative conditions which automatically terminate card copying operation. On of these is exhaustion of the tabulating cards 115 in the hopper 120 when the card copying job has been completed. When cards 116 are no longer sensed by the switch SW-7, that switch closes to complete an energizing path for the cutoff knife solenoid SOL-2 through switches SW-4 and SW-2.2. Solenoid SOL-2 then actuates the cutoff knife mechanism 80 to sever the copy paper strip 41 as is appropriate after copying all the cards 116 in the hopper 120. In addition, the closing of switch SW-7 completes a circuit to the feed release solenoid SOL-3 through switches SW-4 and SW-2.3, so that solenoid SOL-3 then releases the feed control lever 300 to open the switch SW-4. This in turn deenergizes the solenoid SOL-1 to declutch the copy paper feed rollers 76 and 78 and discontinue the delivery of the copy paper strip 41. In addition, after the passage of the time delay, the switch SW-5 opens to deenergize solenoid SOL-4 and disengage the card feed clutch 190, since the card hopper 120 is now empty.

The other condition which automatically terminates card mode operation is exhaustion or discontinuity of the copy paper strip 41 upstream from the feed roller 76 and 78. When this happens, arm 371 is transferred and SW-8 closes. As a result, the solenoid SOL-3 is energized to release the lever 300 and open the switch SW-4. This declutches the paper feed rollers 76 and 78, which are no longer needed once the copy paper strip 41 is no longer there to be fed. The same

movement of the sensing arm 371 which closes switch SW-8 also opens the other copy paper sensing switch SW-9, so that upon interruption of the copy paper strip 41 the solenoid SOL-4 is immediately deenergized and the clutch 190 disengaged to stop feeding tabulating cards 116 to the copying station 22.

During card copying operation the successive tabulating cards 116 emerging from the copying station 22 under control of the rollers 56 and 58 pass between the gating members 70 and the plate 356, and then pass below the panel 62 and fall through passageway 379 into output bin 126 where they are caught upon the floating card catcher tray 128. At the beginning of the card copying run, the catcher tray is near the top of the output bin 126 so that the tabulating cards can not flip over as they fall, but instead land flat upon the tray. This insures that the cards will not be damaged as other cards accumulate above, and also insures that they are deposited in the proper sequence. But then as cards accumulate on the tray 128, the effective card catching surface becomes the rising top of the output deck 380. Therefore, in order to made room for the steadily increasing thickness of that deck, and to keep the effective card catching surface near the top of the output bin 126 so that subsequent cards are caught in the same way, the tray 128 is mounted upon a floating mechanism 382 which slowly lowers it toward the bottom of the bin 126 in response to the increasing weight of the output deck 380.

As seen in FIGS. 1, 8 and 9 the tray 128 is in the form of a plate having depending ears 384 at opposite sides thereof. Each of these ears is provided with an upper roller 386 journaled on a stub shaft 388 and a lower roller 390 journaled on a stub shaft 392. The lower rollers 390 are set somewhat forwardly on the upper rollers 386, and all four rollers are formed with peripheral grooves 394 to receive respective vertical rail 396 on opposite sides of the output bin 126. The center of gravity of the tray 128, with or without the output deck 380, is forward of the rails 396, causing the entire assembly to be gravity biased so that the rollers 386 and 390 on each side clasp their associated rails therebetween, to suspend the catcher tray 128 at any required height along the rails. In addition, the rollers 386 and 390 roll on the rails 396 to permit relatively easy adjustment of the vertical position of the catcher tray 128.

Each of the rails 396 is supported at its top by tongue-in-groove engagement with a holding bracket 398 which is secured to the rear wall 400 of the output bin 126. At their lower ends the rails 396 have extension pins 402 which are received within appropriate openings in the floor plate 404 of the output bin 126. The rear wall 400 is formed with a cutout 401 at the top which defines the lower edge of passageway 379.

The catcher tray 128 is held at whatever height is appropriate to the instantaneous size of the tabulating card output deck 380, by a counter balancing mechanism comprising a coil spring 406 anchored at its lower end to a tab 408 which projects from the rear wall 400. The upper end of the spring is hooked through a suitable opening in the center of a bar 410. The opposite ends of this bar have openings to which are secured the ends of respective wires 412. The wires extend upwardly from the bar 410 and are wound first about the smaller diameters 414 and then about the larger diameters 416 of a pair of compound pulleys, which are rotatably mounted by means of stub shafts 418 on the rear wall 400. FRom the larger diameter section 416 of each compound pulley the wires 412 extend to the respective ears 384 of the catcher tray 128, and are secured to openings 420 therein. By this means the counterbalancing spring 406 exerts a continuous, yielding upward force on the catcher tray 128. As the weight of the card output deck 380 increases, the catcher tray 128 sinks within the output bin 126, and the wires 412 unreel from the compound pulleys 416, 414, raising the bar 410 and extending the spring 406.

The cards 380 are further confined by a front panel 422 which is a continuation of the top panel 62, and which bends over into engagement with the floor panel 404 at the bottom of the bin. In order to confine the cards 380 laterally, a pair of moveable side panels 424 are provided, which are held in place by the horizontal tension exerted by a pair of coil springs 426 engaging the side panels 424 at one end and hooked at the other end into suitable openings 428 formed in the rear wall 400. At the top, the side panels 424 are formed with pins 430 which extend through suitable openings in lugs 432 bent from opposite sides of the holding bracket 398. At the bottom the side panels 424 are formed with similar pins 434 which engage suitable openings in the floor panel 404. The pins 430 and 434 rotatably mount the side panels 424 so that either panel can be swung aside against the force of its spring 426, to provide access to the bin for removing the card deck 380. Afterwards the spring 426 returns the panel 424 to its original position. Lugs 427 bent from the rear wall 400 serve to limit the spring-baised motion of panels 424, and to define their rest positions.

The entire output bin 126 is supported upon the front panel 436 of the copying machine 20 by means of a pair of brackets 440 bent from the bin rear wall 400. The gate shaft 72 passes through openings in these brackets, and in turn is supported on the copying machine side panels 157. Near the lower end of the output bin 416 are slots 441 which engage downwardly over fastener shanks 443 protruding forwardly from the copying machine front panel 436. The shanks 443 are provided with enlarged fastener heads 442, which serve to retain the shanks 443 within the slots 441. Enlarged openings 444 communicate with the slots 441 to provide for initial engagement with the enlarged heads 442.

FIGS. 10 and 11 provide a detailed view of the mechanism which delivers the copy paper strip to the exit 104 and winds it up on the takeup reel 132 during card-copying operation. Roller 110 in FIG. 1 is conventionally driven by the main drive chain 150, and rotates on a shaft 450 suitably journaled in the side panels 157 of the machine 20. This roller has looped thereover one end of each of four conveyor belts 106, the upper strands of which move to the left (as seen in FIGS. 1, 10 and 11) in response to counterclockwise rotation of the roller 110. Thus belts 106 convey the output strip 40 or 41 toward the machine exit 104. The four conveyor belts 106 span a breadth which is adapted to convey the 8½ inch width of document-sized copy paper 40 when the machine is used in the document mode, while the two innermost belts 106 are sufficiently closely spaced to carry the narrower width of copy paper strip 41 which is used for address labels. The conveyor belts 106 also act as drive belts to rotate roller 112 upon a shaft 452 which is supported between machine side panels 157. The roller 112 is provided with grooves 456 for keeping the conveyor belts 106 in proper alignment, and similar grooves (not shown) are preferably formed on the roller 110.

The roller 112 is further provided with additional grooves 458 for proper alignment of a further set of conveyor belts 108 which are looped thereabout and are driven by the roller 112. The belts 108 serve to convey the copy machine output paper 40 or 41 the rest of the way toward the exit 104. The four of them are spaced widely enough to accommodate the 8½ inch regular document width of copy paper 40, which the two innermost belts 108 are properly spaced to support the narrower width of address label copy paper strip 41. The other ends of belts 108 are looped about the roller 114 and are engaged in grooves 460 thereof for proper alignment. The roller 114 is secured to a shaft 462 which is journaled in a pair of side panels 464 of a reel mechanism supporting member 465 located at the machine exit 104. These side panels are formed with hooks 466 which engage over the shaft 452 to keep the supporting member 465 properly positioned. The member 465 also includes a floor panel 480.

In the document mode, as each copy emerges from the exit 104 upon the conveyor belts 108, it is manually retrieved by the operator of the copying machine 20. But in the card mode, as the continuous label strip 41 emerges from the exit 104, it is taken up continuously upon a reel 132. The takeup reel is secured to a shaft 136 provided with large diameter rims 138

at the opposite ends thereof. The rims **138** serve as lateral containment for the roll **134** of label output strip **41**, and also serve as a driving means of the shaft **136** and takeup reel **132**. In order to accomplish this latter function, the enlarged rims **138** are in frictional driving engagement with the roller **130** which in turn is secured to a drive shaft **467** to rotate the roller. The drive shaft **467** has a gear **468** at one end which in turn meshes with a gear **470** on the shaft **462** of the conveyor belt roller **114**. Consequently, the conveyor belts **108** provide the drive for the takeup reel **132**.

The shaft **136** rotates on, and is gravitationally retained in place upon, the arms **462** of a U-shaped bracket **474**. The bracket in turn is mounted on a rod **476** which is supported at either end by the panels **464** and which extends through the bracket arms **472**. A second rod **478**, also supported at either end by the panels **464**, engages the lower end of the bracket **474** in order to limit its rotation about the rod **476**.

When the copying machine **20** has completed its work, the reel **132** and shaft **136** carrying the label output roll **134** are removed therefrom and operatively mounted in a conventional labeling machine.

Any suitable means, such as a conventional-type photocell arrangement, may be used to insure that the locations of the strip cutting lines are between the successive field of said addresses. Further the copy paper **40** may be provided with conventional indicia or pin feed holes so that the output strip **41** may be efficiently used in conventional-type labelling equipment. Here again suitable means are provided for synchronizing the movement of such an output strip and the feed of said tabulating cards **116**.

It will now be appreciated that the present invention provides a novel system, having both method and apparatus aspects, for the rapid automatic printing and application of large numbers of mailing address labels; the system dispensing with conventional printing presses and plates, and thus avoiding the multitude of disadvantages which they entail. In addition, the card copying apparatus of the system involves several novel and advantageous modifications to an existing photocopying machine which enables it to copy a continuous stream of tabulating cards.

Since the foregoing description and drawings are merely illustrative, the scope of protection of the invention has been more broadly stated in the following claims. These claims should therefore be liberally interpreted so as to obtain the benefit of all equivalents to which the invention is fairly entitled.

The invention we claim is:

1. In a photocopy machine having an illuminating station, a document entrance to said illuminating station, means for moving material through said illuminating station, and a document exit from said illuminating station, the improvement comprising: a record card supply hopper on said machine, means for delivering record cards sequentially from said hopper to said illuminating station, a record card exit means from said illuminating station, a document exit means from said illuminating station separate from said record card exit means, and means for selectively directing said material through said record card exit means or said document exit means.

2. In a photocopy machine as in claim **1**, the additional improvement comprising: a gate member moveable between a position in which to divert to said document exit means any material issuing from said illuminating station, and a position in which to divert said material to said record card exit means.

3. In a photocopying machine having a station for copying material, means for moving said material through said copying station, means for storing an elongated strip of copy paper, printing means, means for feeding said copy paper strip longitudinally through said printing means, means for correlating the operation of said copy paper feeding means with the passage of an original document through said machine, and means including a knife for severing said copy paper strip to the length of said original document; the improvement comprising:

a record card supply hopper on said machine;

means for delivering cards sequentially from said hopper to said station for copying;

card mode selecting means;

means responsive to said card mode selecting means for disabling said correlating means to keep said copy paper feeding means operating while a plurality of cards are copied whereby to distribute the copies of said cards along the length of said copy paper strip;

and means responsive to said card mode selecting means for disabling said severing means during the copying of said cards whereby to create a continuous strip of said copies.

4. In a machine as in claim **3** including means for driving said copy paper feed means, and an exit through which said continuous copy paper strip emerges from said machine after printing, the additional improvement comprising: means adjacent said exit for reeling up said continuous strip, said reel-up means being driven by said copy paper feed drive means.

5. The invention of claim **3** further comprising: means for disabling said machine, and means for sensing at least one of the following materials; said record cards in said hopper or said copy paper supply; said sensing means being conditioned by said card mode selecting means to actuate said machine-disabling means whereby to interrupt said card copying operation when said material is not sensed.

6. The invention of claim **5** further comprising: means responsive to said sensing means to actuate said severing means notwithstanding said disabling means, said sensing means being arranged to sense said record cards in said hopper, whereby to sever said copy paper strip when copying of the record cards in said hopper is completed.

7. The invention of claim **5** wherein said machine-disabling means is effective to interrupt said record card delivery means, and said sensing means is arranged to sense said copy paper in said storage means, whereby to stop feeding cards when said copy paper supply is exhausted.

8. The invention of claim **7** wherein said machine-disabling means is also effective to terminate the operation of said paper feeding means when said copy paper supply is exhausted.

9. The invention of claim **7** wherein said sensing means comprises a first device for sensing said record cards in said hopper and a second device for sensing said copy paper supply, said machine-disabling means being connected to both said first and second sensing devices to interrupt said record card delivery means when either said record cards are exhausted or said copy paper supply is exhausted.

10. In a machine as in claim **9** wherein said severing means includes electrically actuated means for operating said knife, and said machine includes respective electrically actuated means for interrupting said record card delivery means and for operating said copy paper feed means, the additional improvement comprising: respective circuits for energizing said knife operator, a first switch responsive to said first sensing device, a second switch in parallel with said first switch and responsive to said second sensing device, said switches being connected to interrupt said copy paper feed operator circuit and energize said knife operator circuit when either said record cards or said copy paper are exhausted, a circuit for energizing said record card delivery interrupter, and a third switch responsive to said second sensing device to energize said interrupter circuit whereby to interrupt the delivery of said record cards when said copy paper is exhausted.

11. In a photocopy machine having a copying station, means for advancing document material through said copying station and continuously operating drive means connected to said advancing means for driving the latter, the improvement comprising: a record card supply hopper on said machine, card feed means for removing said cards from said hopper and transporting them toward said copying station, a shaft connecting said card feed means to said drive means for normally continuously driving said card feed means, and clutch means interposed between said shaft and said drive means for engaging and disengaging said shaft with said drive means whereby to start and stop the feeding of said record cards indepen-

dently of operation of said document material advancing means.

12. The invention of claim 11 wherein said card feed means comprises rollers rotatably driven by said shaft and cooperating to propel said record cards toward said copying station, picker means reciprocating to remove successive record cards from said hopper and deliver them to said rollers, and a crank mechanism for reciprocating said picker means, said crank mechanism including wheel means rotatably driven by said shaft.

13. The invention of claim 11 wherein said clutch means comprises a driving hub on said shaft rotatable relative thereto and engaged with said drive train, a driving hub affixed to said shaft for rotation therewith, a coil spring surrounding said driving and driven hubs, means anchoring one end of said coil spring relative to said driven hub, said coil spring normally clutching said driving hub for rotation therewith, means moveable between a position for blocking the free end of said coil spring to prevent it from rotating with said driving hub whereby to disrupt said clutching relationship, and a position for freeing said spring end whereby to restore said clutching relationship, and an actuator for moving said blocking means between said positions.

14. The invention of claim 13 comprising first stop means fixed relative to said shaft, second stop means movable toward and away from a position of engagement with said first stop means at a fixed angular position relative to said shaft to stop rotation of said shaft at said angular position, and means responsive to the movement of said blocking means to its declutching position to move said second stop means into engagement with said first stop means upon declutching.

15. The invention of claim 14 wherein said declutching responsive means includes a spring biasing said second stop means into engagement with said first stop means during declutching, said blocking means being operative to drive said second stop means out of said engagement in opposition to said spring when moving to its clutching position, and to release said second stop means when moved to its declutching position.

16. The invention of claim 11 wherein said machine further comprises means pivotally supporting said hopper whereby said hopper may be rotated to provide access to said card feed means.

17. The invention of claim 16 further comprising a copying station, means for feeding documents through said copying station, means positioned for guide said record cards from said card feeding means to said document feeding means for subsequent delivery to said copying station, and means pivotally supporting said guide means and pivotally connecting it to said hopper for movement therewith to provide access to said card feed means.

18. In a photocopying machine having a copying station, the improvement comprising: means for supplying a continuous series of record cards to said copying station, an exit channel from said copying station for said record cards, an output bin to collect record cards emerging from said exit channel, and a vertically floating card catcher mechanism in said bin comprising a card catcher tray, vertical rail means disposed eccentrically of said tray, paired wheels rotatably mounted on said tray and arranged to clasp said rail means therebetween in response to the weight of said tray whereby to mount said tray for vertical wheeled movement on said rail means, and a counterbalancing spring mechanism biasing said tray upwardly and yielding in proportion to the increasing weight of record cards thereon.

19. In a photocopying machine having means for retaining a supply of copy paper in continuous strip form, printing means, a copy paper exit, and motor driven means for conveying said copy paper from said retaining means through said printing means to said exit, the improvement comprising: a takeup reel near said exit, and a drive mechanism operated by said motor driven means for rotating said takeup reel to wind up said continuous copy paper strip, said conveying means comprising a plurality of rollers at least one of which is driven, means connecting said driven roller to drive the remainder, said connecting means including belts looped over said roller for conveying said copy paper strip to said exit, said takeup reel being secured to a shaft for rotation thereby, means rotatably supporting said shaft and reel, said shaft having an enlarged rim drivingly secured thereto, said rim having a substantially larger diameter than said takeup reel and being in driving engagement with one of said rollers, whereby said rim drives said reel and supports it above the roller which engages said rim.

20. The invention of claim 19 wherein said shaft supporting means comprises a bracket having spaced arms extending therefrom to support opposite ends of said shaft, said arms slanting so that said shaft rolls downwardly thereon to bring said rim into gravity biased driving engagement with said roller, and means for supporting said bracket.

21. In a photocopying machine having a copying station, a document feed channel terminating upstream of said copying station, document feed rollers positioned to receive documents emerging from said channel and deliver them to said copying station, and drive means for said document feed rollers, the improvement comprising a card supply hopper on said machine means driven by said drive means for extracting successive cards from said hopper, including card feed rollers positioned to grip said successive cards and driven by said drive means to convey said successive cards toward said document feed rollers, and a plate for guiding said cards into engagement with said document feed rollers for subsequent transportation through said copying station, said card feed rollers being driven at a higher linear speed than said document feed rollers, whereby said cards reach said copying station in overlapped relationship for the production of a more compact copy thereof.

22. The invention of claim 21 further comprising means pivotally mounting said card supply hopper and guide plate on said machine for rotation thereof to provide access to said card extracting means.

23. The invention of claim 22 comprising further means pivoting said guide plate to said card supply hopper for joint pivotal movement relative to said machine and relative to each other.

24. In a photocopying machine including means for storing copy paper, a printing station, clutched means for feeding said copy paper to said printing station, a solenoid for controlling the clutching of said paper feed means, an energizing circuit for said solenoid, a copying station, a channel for inserting a document into said copying station, and means including an electrical switch for sensing said document in said channel and completing the energizing circuit of said solenoid to feed said paper only during the passage of said document, the improvement comprising manual feed control means arranged to close said document sensing switch indefinitely whereby to feed an indeterminate length of said copy paper, a record card supply hopper on said machine, and means for feeding a stream of record cards from said supply hopper to said copying station to create an elongated photocopy of successive cards on said length of copy paper.

25. In a machine as in claim 24 including electrically actuated copying means and means including an electrical switch responsive to said document sensing switch for turning on said copying means after said document is sensed thereby, the additional improvement comprising a clutch for engaging said card feed means, and a solenoid for engaging said clutch, said clutch solenoid being connected for energization under control of said copying means switch whereby to feed said cards only when said copying means is turned on.

26. The invention of claim 24 further comprising means for latching said manual feed control means in position to lock said document sensing switch in its closed condition, and means for thereafter unlatching said manual feed control means.

27. The invention of claim 25 further comprising a solenoid and means connecting said solenoid to release said latching means to terminate copy paper feed.

28. The invention of claim 27 wherein said sensing switch has a feeler arm interposes in said channel, said manual feed control means comprises a lever for manual operation, an actuator, means on said actuator extending toward said channel for engagement with said feeler arm to close said switch, and means movable in response to said lever to move said actuator so that said means engages said feeler arm, said latching means comprises a segment moveable with said moveable means and formed with detents, and spring-loaded means engaging said detents to latch said segment and said moveable means in position to lock said switch, and said solenoid has an armature responsive thereto and a linkage connecting said armature to dislodge said segment.

29. The invention of claim 27 further comprising means for sensing at least one of the following materials; said copy paper supply or said cards in said supply hopper; and for energizing said latch release solenoid in the absence of said sensed material.