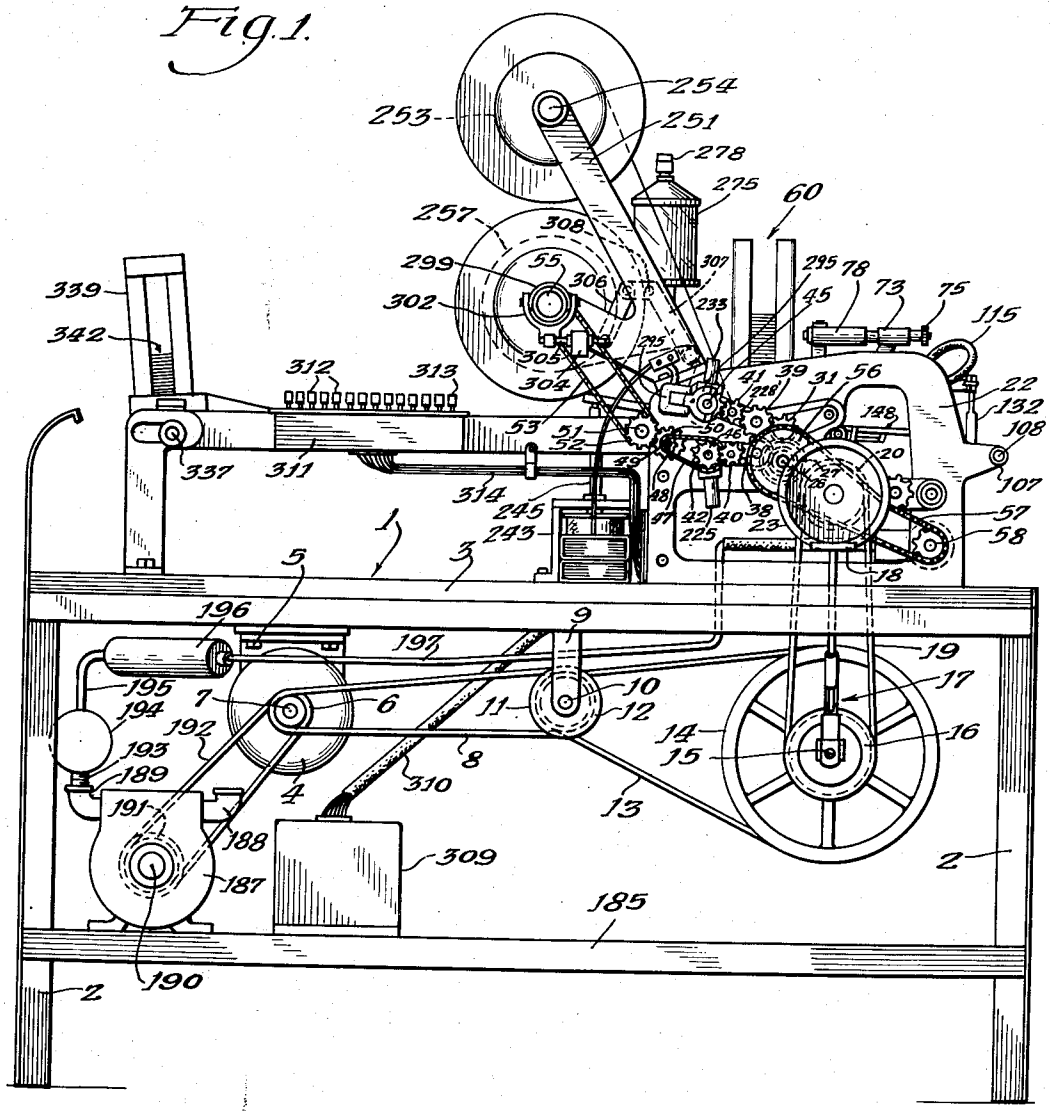
Dec. 22, 1953 E. C. SAUERMAN ET AL 2,663,253

SELECTIVE HECTOGRAPHIC PRINTING MACHINE

Filed June 29, 1948

14 Sheets-Sheet 1

Fig. 1.



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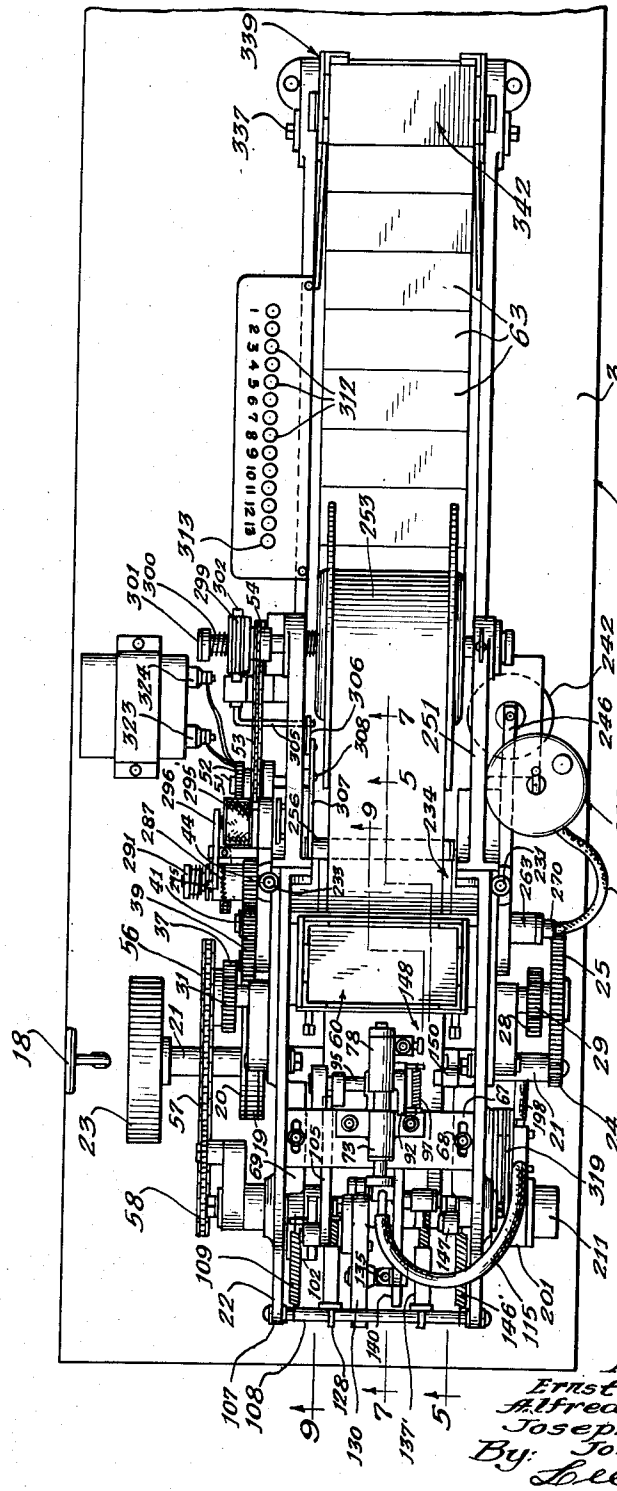
SELECTIVE HECTOGRAPHIC PRINTING MACHINE

Filed June 29, 1948 14 Sheets-Sheet 2

Fig. 2.



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SELECTIVE HECTOGRAPHIC PRINTING MACHINE

Filed June 29, 1948 14 Sheets-Sheet 3

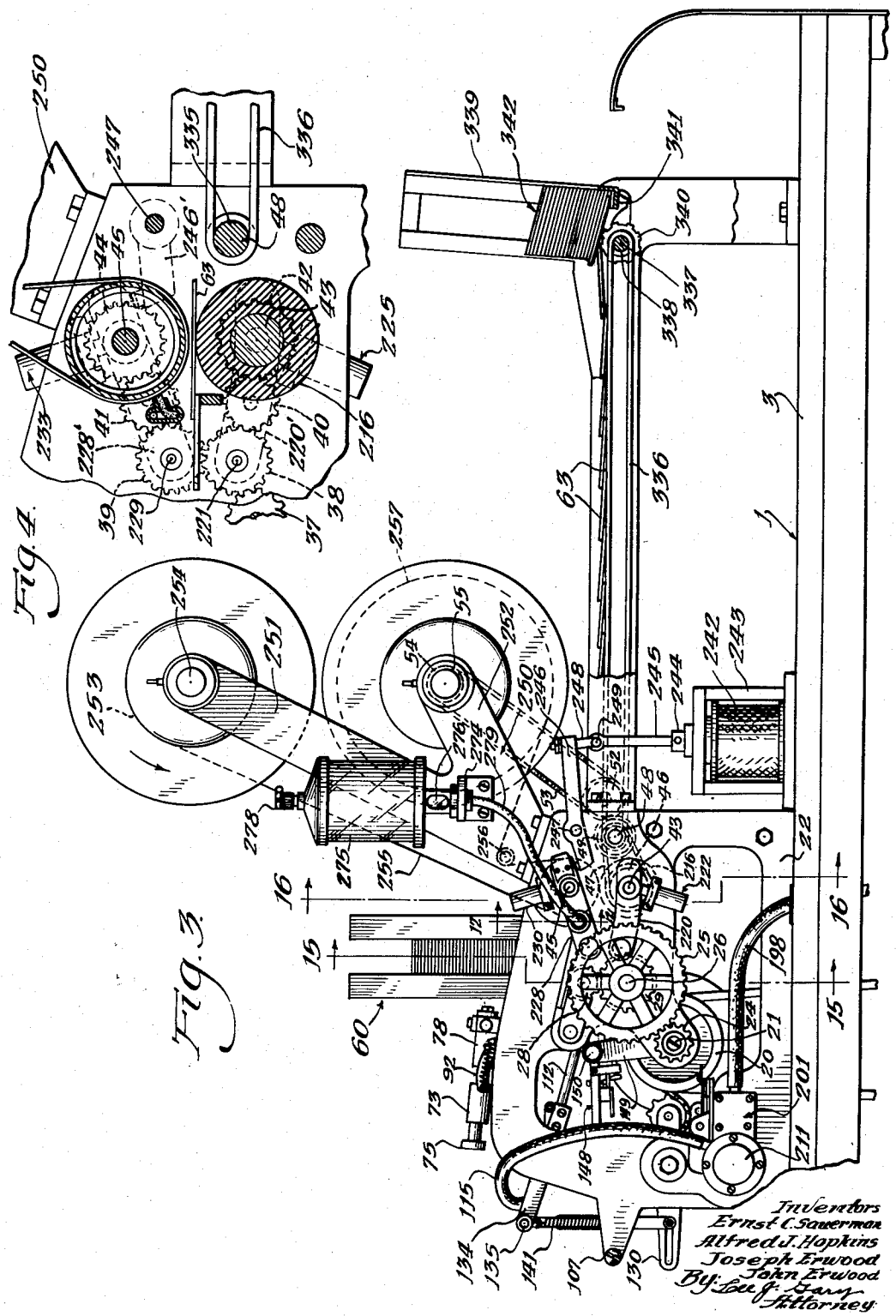

Fig. 4.

Fig. 3.

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SELECTIVE HECTOGRAPHIC PRINTING MACHINE

Filed June 29, 1948 14 Sheets-Sheet 4

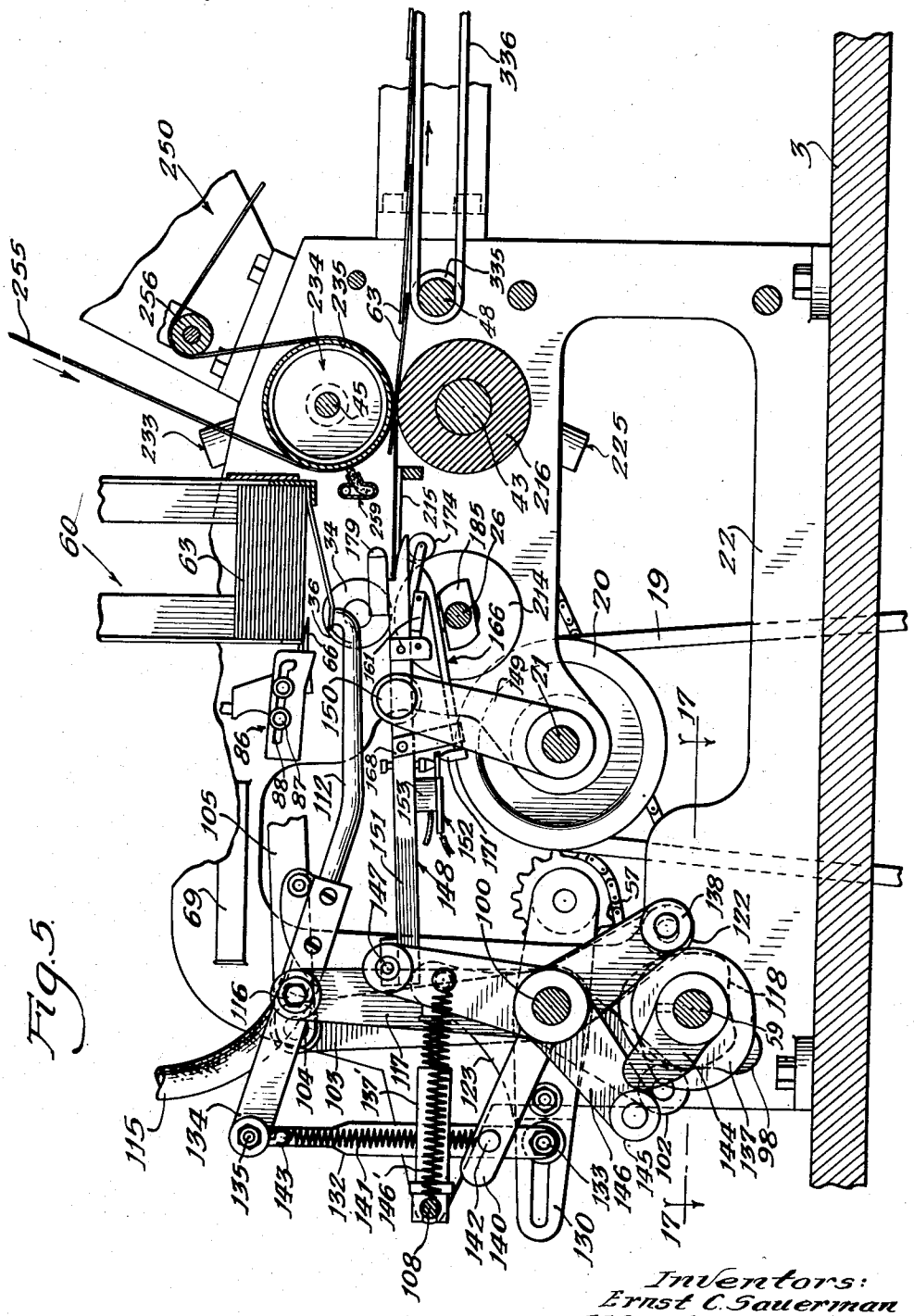

Fig. 5.

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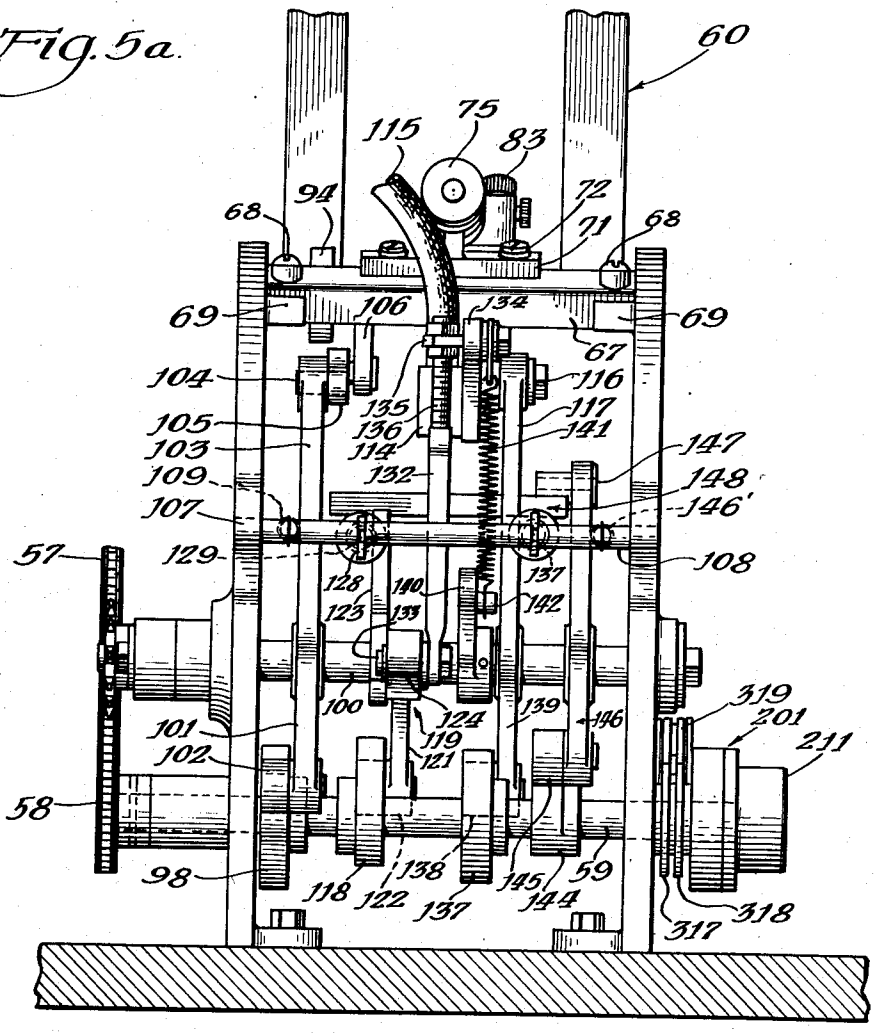
Fig. 5a.



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SELECTIVE HECTOGRAPHIC PRINTING MACHINE

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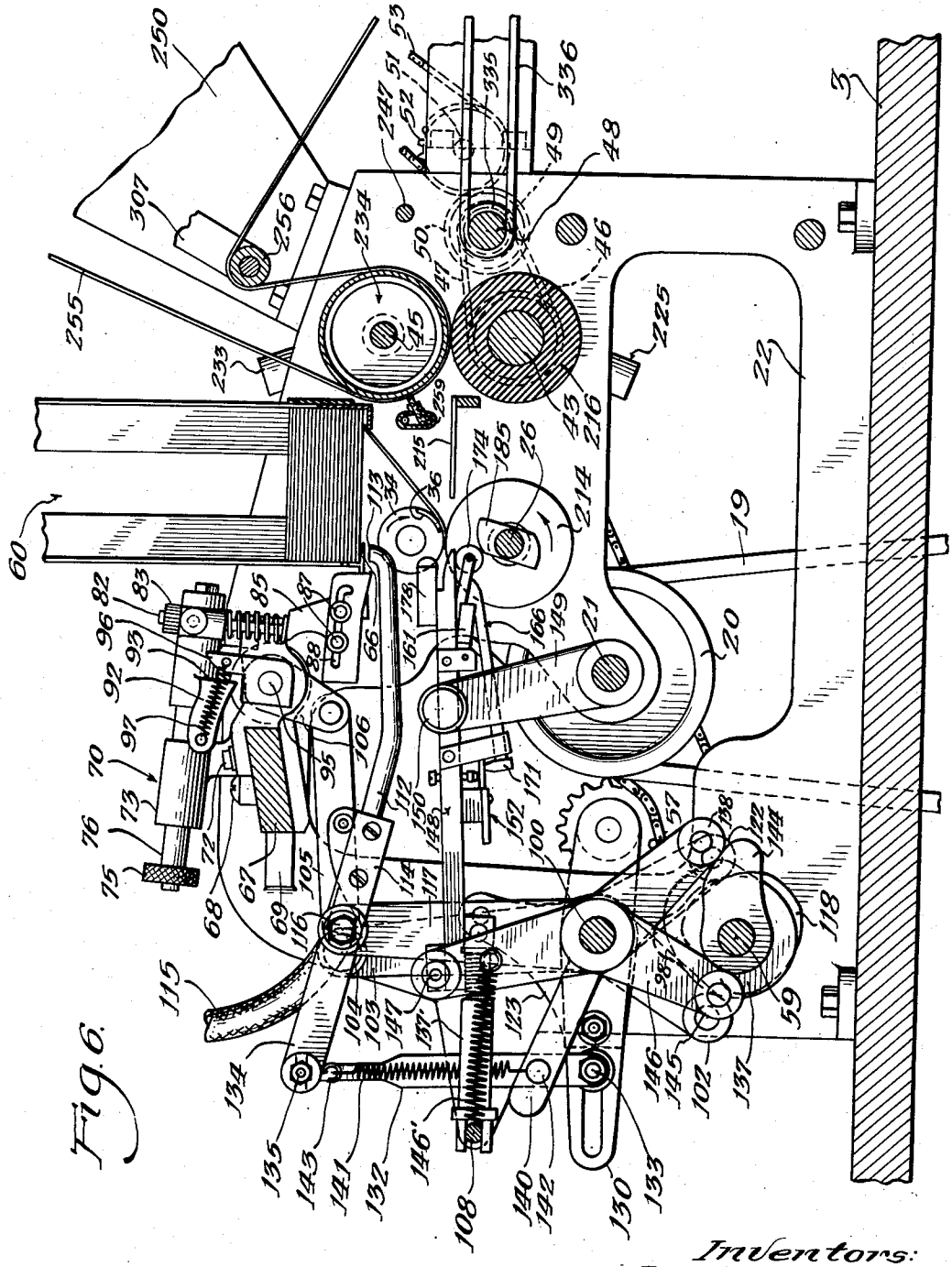

Fig. 6.

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SELECTIVE HECTOGRAPHIC PRINTING MACHINE

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Fig. 8.

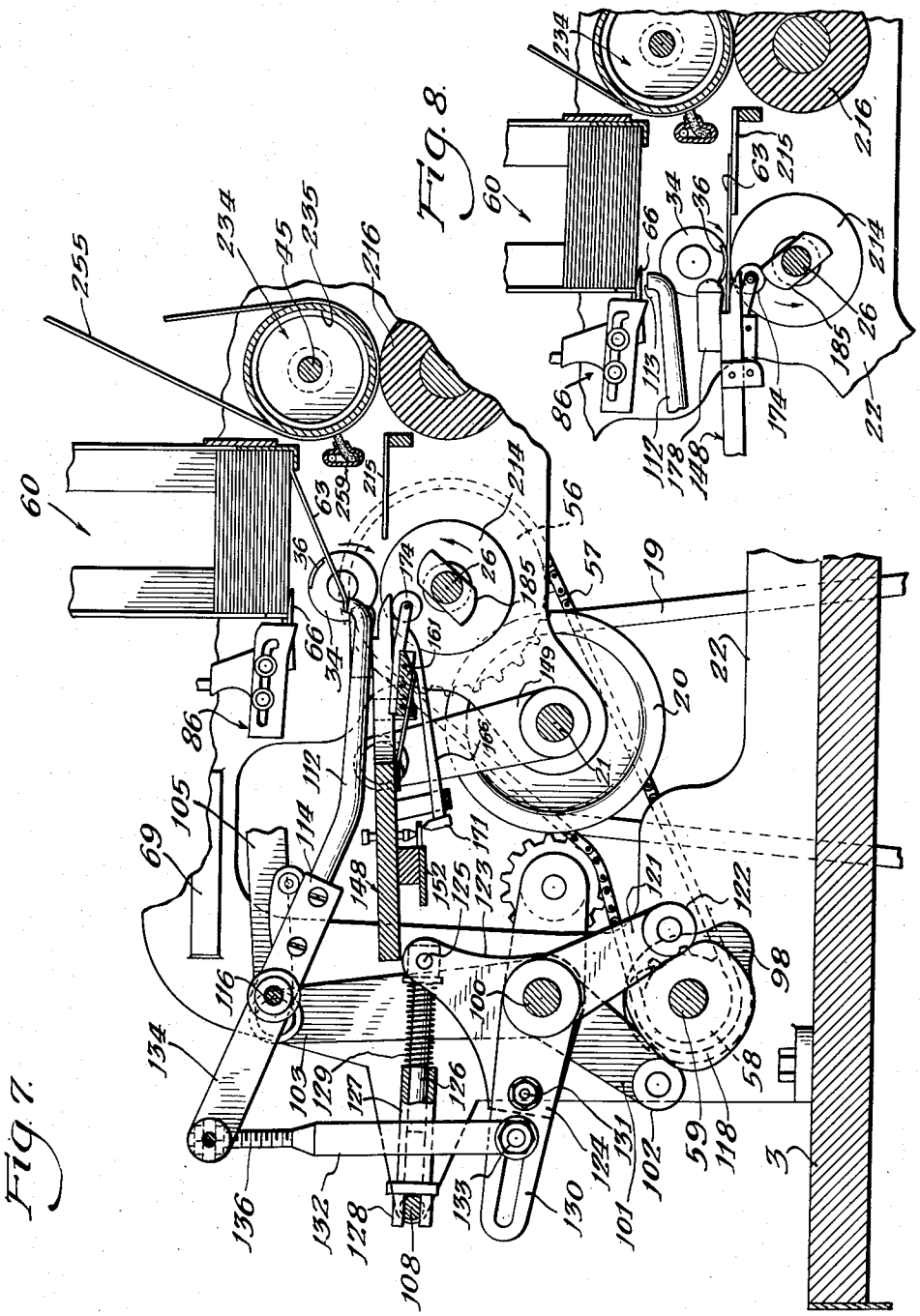

Fig. 7.

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SELECTIVE HECTOGRAPHIC PRINTING MACHINE

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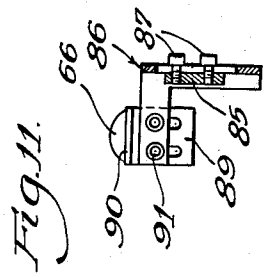

Fig. 11.

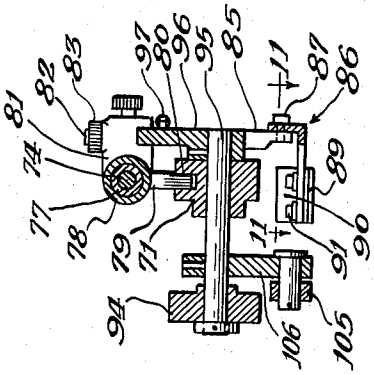

Fig. 10.

Fig. 9.

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Dec. 22, 1953 E. C. SAUERMAN ET AL 2,663,253

SELECTIVE HECTOGRAPHIC PRINTING MACHINE

Filed June 29, 1948 14 Sheets-Sheet 9

Fig. 12.

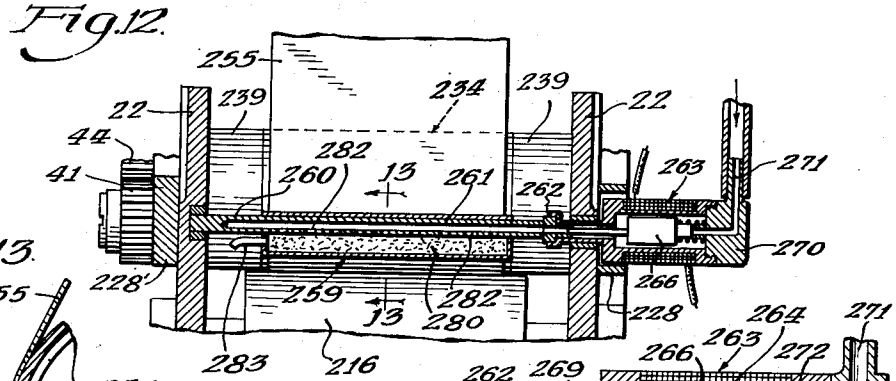
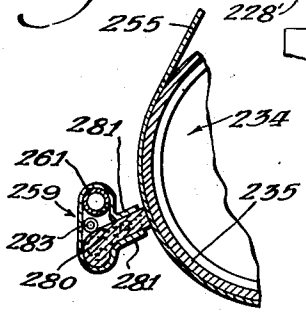


Fig. 13.



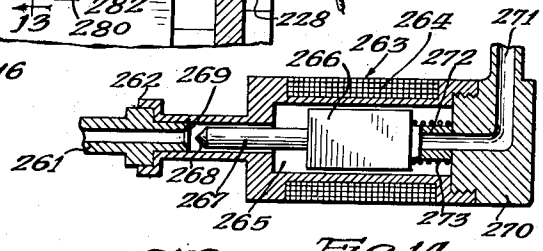
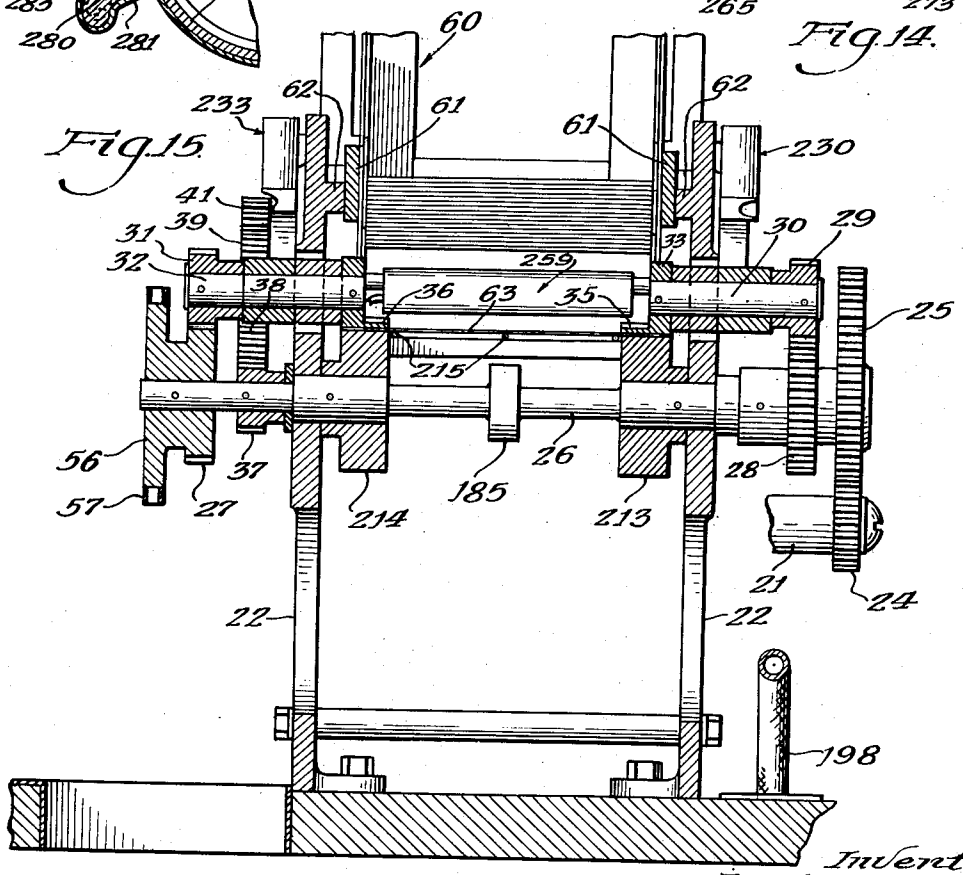


Fig. 14.

Fig. 15.



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SELECTIVE HECTOGRAPHIC PRINTING MACHINE

Filed June 29, 1948

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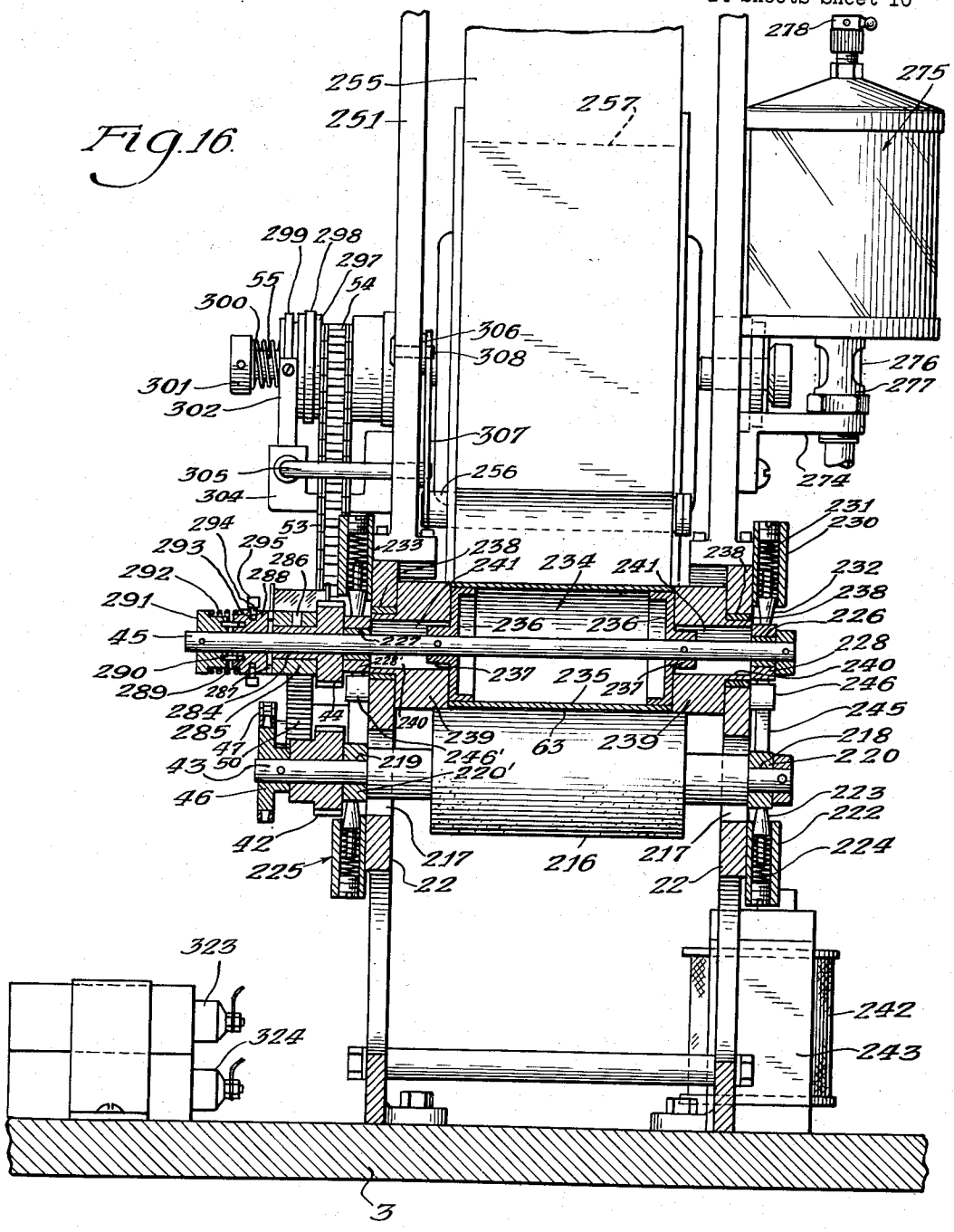
Fig. 16.



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Filed June 29, 1948 14 Sheets-Sheet 11

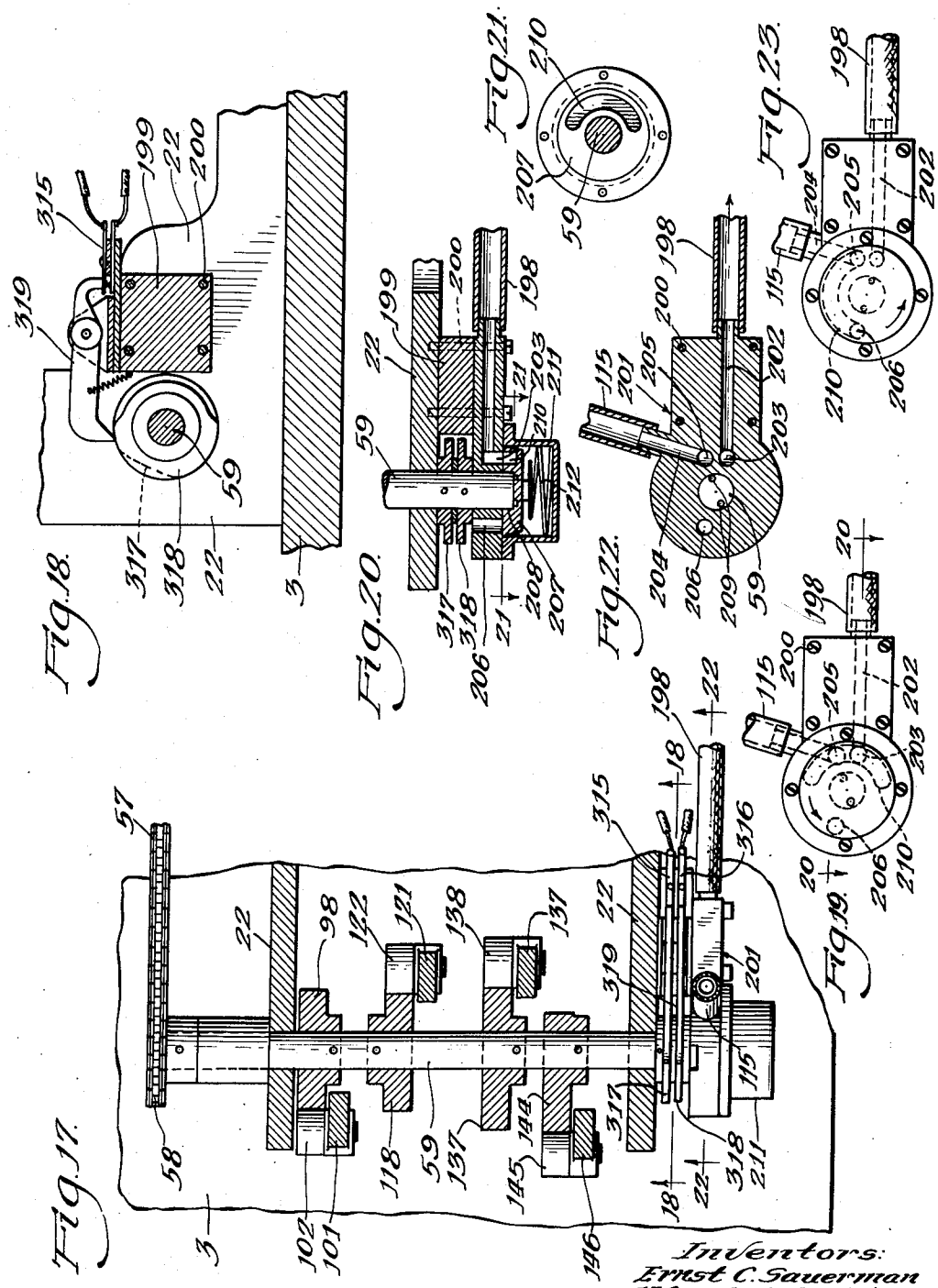

Fig. 18.

Fig. 20.

Fig. 21.

Fig. 22.

Fig. 23.

Fig. 19.

Fig. 17.

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SELECTIVE HECTOGRAPHIC PRINTING MACHINE

Filed June 29, 1948 14 Sheets-Sheet 12

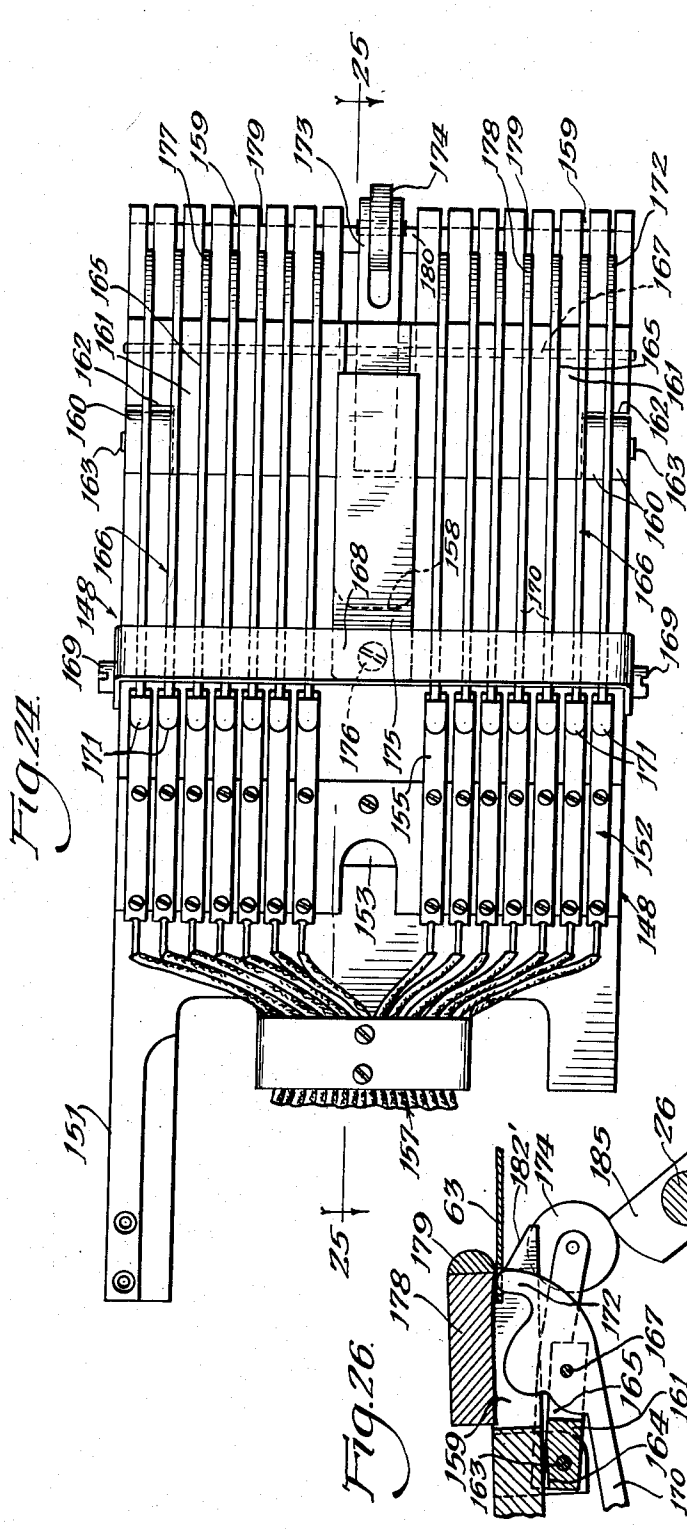

Fig. 24.

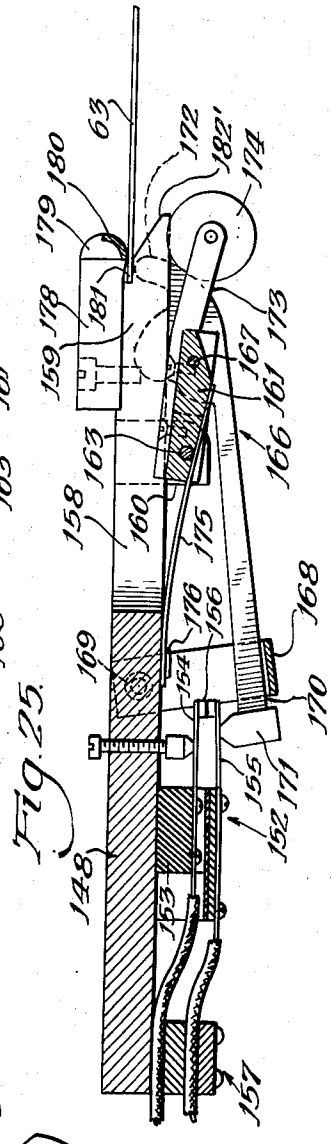

Fig. 25.

Fig. 26.

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SELECTIVE HECTOGRAPHIC PRINTING MACHINE

Filed June 29, 1948 14 Sheets-Sheet 13

Fig. 27.

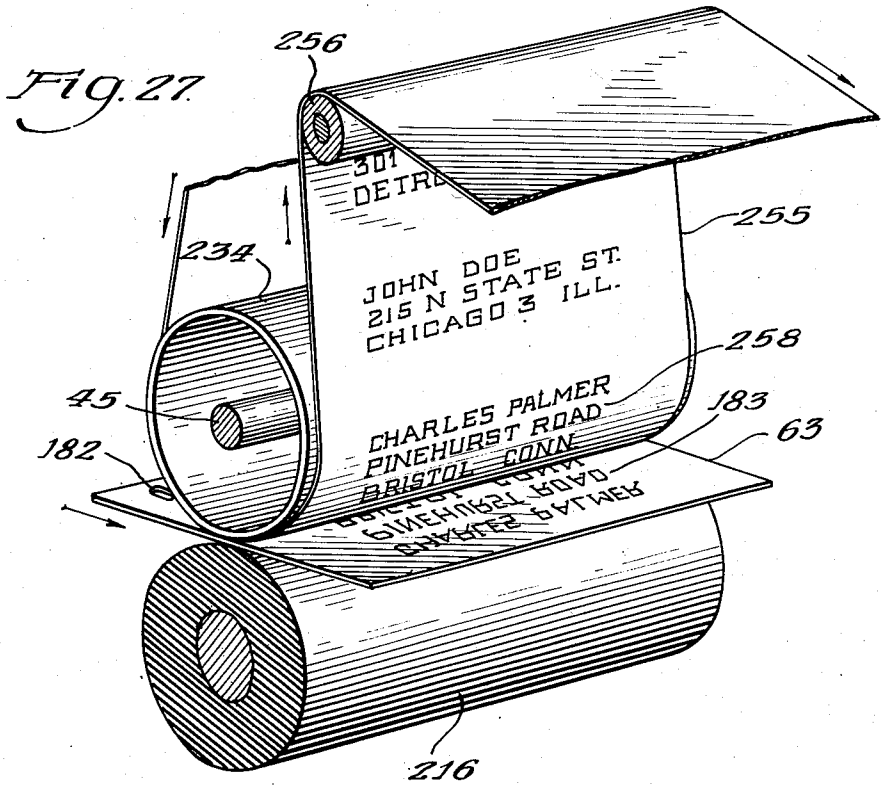


Fig. 28.

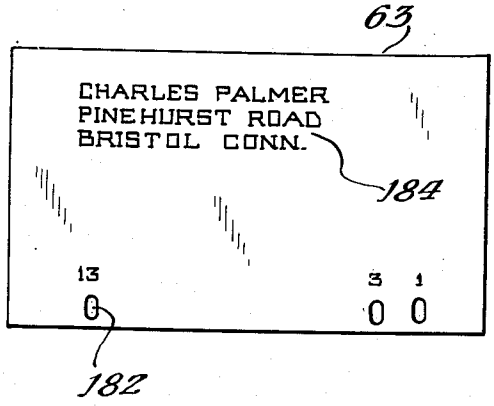
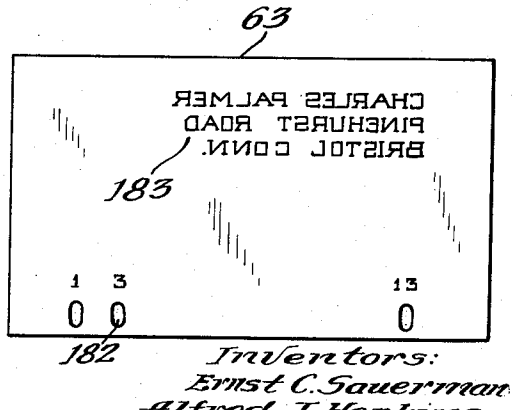


Fig. 29.



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SELECTIVE HECTOGRAPHIC PRINTING MACHINE

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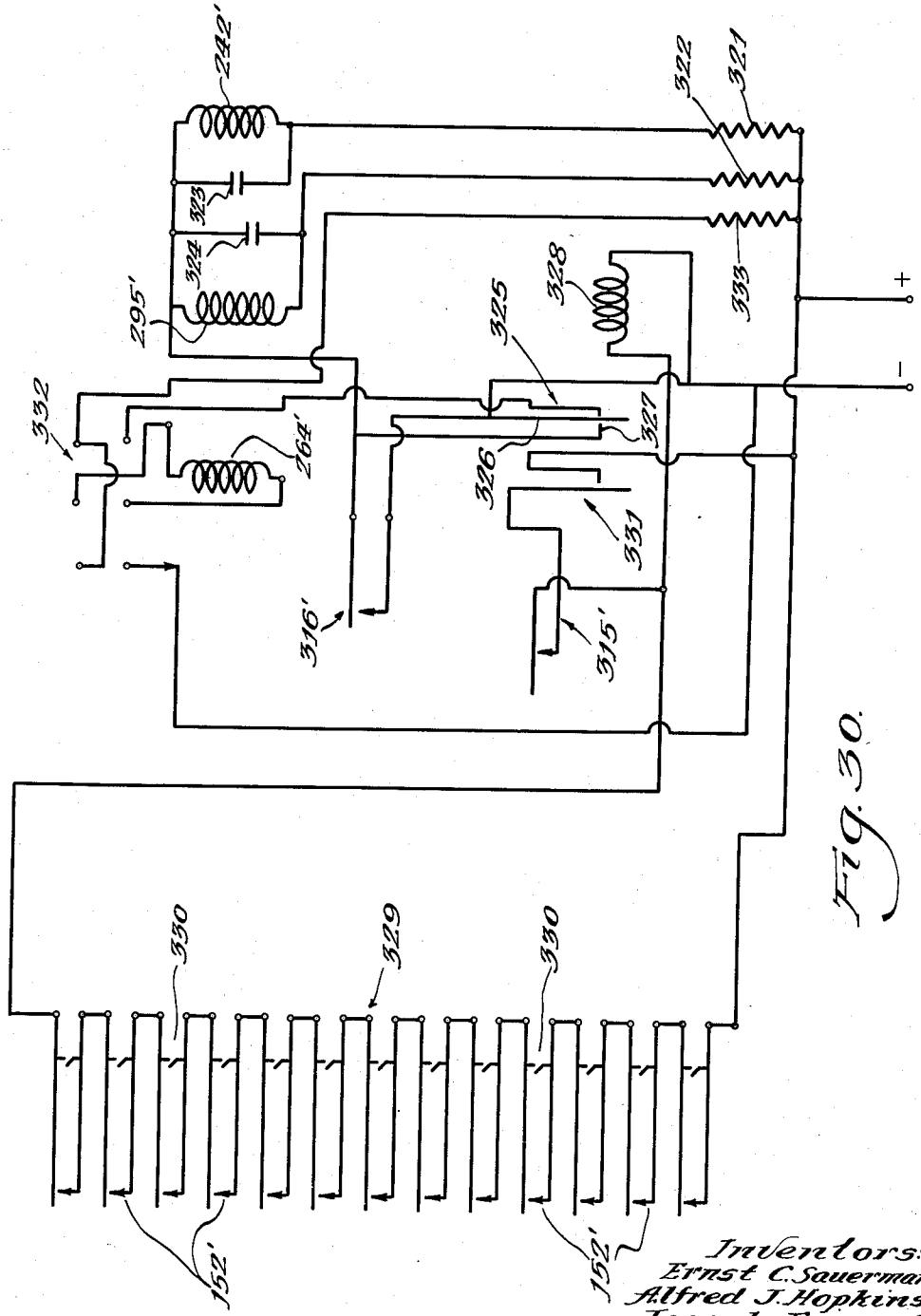

Fig. 30.

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2,663,253

UNITED STATES PATENT OFFICE

2,663,253

SELECTIVE HECTOGRAPHIC PRINTING MACHINE

Ernst C. Sauerman and Alfred J. Hopkins, Chicago, Joseph Erwood, Crystal Lake, and John Erwood, Park Ridge, Ill.; said Joseph Erwood and said John Erwood assignors to Address-It Corporation, Chicago, Ill., a corporation of Illinois

Application June 29, 1948, Serial No. 35,806

17 Claims. (Cl. 101—53)

1

This invention relates to improvements in selective printing machines and refers specifically to a machine for automatically printing from predetermined master printing cards, said cards being selected from a stack of master cards which may contain the selected cards in sequential or non-sequential order.

In commerce certain categories of information are frequently maintained on cards constituting a file of pertinent information relating to the members of the category. It is frequently desirable to select from said main file, cards which may be common to a sub-category and print the relevant information as to said sub-category.

As an example, which, however, is not to be construed in a limiting sense, the main file may comprise names and addresses of prospective customers of a predetermined business, for instance, automobile owners of a given State. In the normal course, these cards would ordinarily be arranged alphabetically. However, in a certain instance it may be desirable to select the owners of 1940 Fords, for example, who may live in a predetermined county of the State, and to print their names and addresses in sequential order.

The present invention is directed broadly to a machine for accomplishing this or a similar task, and one of the objects of the invention relates to the provision of such a machine which simply and efficiently performs this task.

The example hereinbefore set forth involves a triple breakdown of the main file. However, the desired sub-category may involve only a single breakdown of the file or may involve a more limited breakdown.

As another object of the invention a main file may be broken down once or any plurality of times and the desired sub-category selected and printed from in a single pass of the main file through the machine, and this is accomplished merely by depressing one or more of a plurality of selector buttons.

A further feature of the invention resides in the provision of means for moving a web of paper upon which the names and addresses may be printed from the selected cards in sequential manner with a desired or optional spacing between sequentially appearing names and addresses.

Another important feature of the invention resides in the provision of a card feeding mechanism which urges each card of the main file forwardly with equal force regardless of whether the card is to be printed from or not, while at the same time preventing the non-selected cards from being smudged.

2

A further feature of the invention resides in automatic timed means for moving the web during the printing operation while maintaining the web stationary when non-selected cards pass the printing station.

Another important feature of the invention comprises a feeder mechanism which simultaneously urges the printing cards forwardly while performing the function of actuating the selecting mechanism, that is, both feeler mechanism and cards are moving during the actuation of the selecting mechanism and relative motion of the feelers and cards is not contemplated.

In the drawings, Fig. 1 is a side elevational view of a machine embodying the concepts of this invention.

Fig. 2 is a top plan view of the machine in the position illustrated in Fig. 3.

Fig. 3 is an enlarged detailed side elevational view of the machine viewed from the side opposite that shown in Fig. 1.

Fig. 4 is a fragmentary detailed sectional view illustrating particularly the pressing members at the printing station.

Fig. 5 is a detailed sectional view taken on line 5—5 of Fig. 2 illustrating the manner of removal of cards from the main file and the feeding thereof forwardly to the printing station.

Fig. 5a is an end elevational view of the machine.

Fig. 6 is a longitudinal sectional view similar to Fig. 5 showing various of the instrumentalities in different positions.

Fig. 7 is a sectional view taken on line 7—7 of Fig. 2 illustrating particularly the feeler cam in non-operative position.

Fig. 8 is a fragmentary view similar to Fig. 7 illustrating the feeler cam in operative position.

Fig. 9 is a sectional view taken on line 9—9 of Fig. 2 illustrating a mechanism for removing cards in seriatim from the main file.

Fig. 10 is a detailed sectional view taken on the line 10—10 of Fig. 9.

Fig. 11 is a detailed sectional view taken on line 11—11 of Fig. 10.

Fig. 12 is a transverse detailed sectional view taken on line 12—12 of Fig. 3 illustrating the web moistening device.

Fig. 13 is a detailed sectional view taken on line 13—13 of Fig. 12.

Fig. 14 is an enlarged detailed sectional view illustrating the plunger employed in conjunction with the moistening device.

Fig. 15 is a transverse sectional view taken on line 15—15 of Fig. 3.

Fig. 16 is a transverse sectional view taken on line 16—16 of Fig. 3, illustrating particularly the cooperative rolls at the printing station.

Fig. 17 is a detailed sectional view taken on line 17—17 of Fig. 5, illustrating the cam shaft of the machine.

Fig. 18 is a detailed sectional view taken on line 18—18 of Fig. 17 illustrating two cam operated switches.

Fig. 19 is a fragmentary end elevational view of the vacuum control valve employed with the machine.

Fig. 20 is a detailed sectional view taken on line 20—20 of Fig. 19.

Fig. 21 is a detailed sectional view taken on line 21—21 of Fig. 20.

Fig. 22 is a sectional view taken on line 22—22 of Fig. 17.

Fig. 23 is a view similar to Fig. 19 showing the valve control member in a different position.

Fig. 24 is a bottom plan view of the pusher plate, illustrating particularly the feeler finger.

Fig. 25 is a sectional view taken on line 25—25 of Fig. 24.

Fig. 26 is a fragmentary sectional view illustrating a feeler finger in operative position with respect to one of the cards.

Fig. 27 is a diagrammatic perspective view of the web and cooperating card in printing relationship at the printing station.

Fig. 28 is a face view of one of the printing cards.

Fig. 29 is a view of the opposite face of the card shown in Fig. 28.

Fig. 30 is a schematic drawing of the electrical circuit employed in conjunction with the machine.

Referring in detail to the drawings, 1 indicates a table or support upon which the machine comprising the concepts of the present invention is mounted. The table 1 is provided with legs 2 which carry a flat supporting top 3.

An electric motor 4 is mounted upon the lower face of the top 3 and is secured thereto by means of bolts 5 or the like. A pulley 6 is mounted upon the motor shaft 7 and an endless belt 8 is adapted to be trained around the motor pulley 6. A hanger 9 is suspended from the table top 3 and a shaft 10 is supported thereby. The shaft 10 carries a pulley 11 around which the belt 8 is trained. A second pulley 12 is also carried upon shaft 10 and an endless belt 13 is trained around pulley 12. A pulley wheel 14 is carried upon shaft 15 and a second pulley 16 is loosely carried upon said shaft. A conventional clutch mechanism 17 operated by means of handle 18 functions to engage or disengage the pulley 16 from shaft 15.

An endless belt 19 is trained around pulley 16 and functions to rotate pulley 20 carried upon shaft 21, journalled in frame 22 which latter constitutes the frame of the machine proper. A wheel 23 is also carried upon shaft 21 and can be employed to manually move the shaft 21 independently of the driving mechanism, hereinbefore described, whereby to permit relatively slow motion to be imparted to the moving parts of the machine so as to facilitate the proper timing of the various elements of the machine.

As shown best in Figs. 2 and 15, shaft 21 extends transversely across the frame 22, and said shaft carries at its opposite end a pinion 24 which meshes with spur gear 25 which is keyed to shaft 26. Shaft 26 extends entirely across frame 22 and carries a spur gear 27 upon its opposite end. A similar spur gear 28 is keyed to shaft 25 adjacent the spur gear 25.

Spur gear 28 meshes with pinion 29 carried upon stub shaft 30 journalled in one of the side frame members. A similar pinion 31 is carried upon a stub shaft 32 which is journalled in the opposite side frame member. A collar 33 is keyed to the inner end of the shaft 30 and a similar collar 24 is keyed to the inner end of shaft 32, and shafts 30 and 32 are in an axial alignment. A segment 35 is carried upon collar 33 and a similar segment 36 is carried upon collar 34, said segments, when the machine is in proper adjustment being in alignment with each other transversely of the machine. The purpose of these collars and the segments carried thereby will be hereinafter more fully described.

A pinion 37 is keyed to shaft 26 and meshes with a spur gear 38, shown best in Figs. 1 and 15. Spur gear 38, in turn, meshes with a spur gear 39, both gears 38 and 39 being idler gears. Gear 39 meshes with an idler pinion 40 and gear 39 meshes with an idler pinion 41. Pinion 40 meshes with gear 42, which is keyed to shaft 43, shown best in Fig. 16. In similar fashion pinion 41 meshes with gear 44, which is loosely carried upon shaft 45.

A sprocket wheel 46 is keyed to shaft 43 and is adapted to drive a sprocket chain 47, as shown best in Figs. 1 and 16. A shaft 48 is journalled in frame 22 and a sprocket wheel 49 is mounted upon said shaft. Gear 50 is rigidly connected to the sprocket wheel 49 and said gear is rotated by means of the engagement of sprocket chain 47 with the sprocket wheel 49. A shaft 51 is mounted upon frame 22 and a gear 52 (Fig. 2) is loosely mounted upon shaft 51, said gear meshing with gear 50 whereby motion is imparted to the gear 52. A sprocket wheel (not shown) is rigidly connected to gear 52, both sprocket wheel and gear being loosely positioned upon shaft 51, and a sprocket chain 53, shown best in Fig. 16, is trained around said sprocket wheel. The sprocket chain 53 functions to drive sprocket wheel 54 loosely mounted upon shaft 55.

Referring particularly to Fig. 15, a sprocket wheel 56, which may be formed integral with gear 27, is keyed to shaft 26. A sprocket chain 57 (Fig. 2) is trained around sprocket wheel 56 and is driven thereby. The sprocket chain 57 in turn is trained around sprocket wheel 58, shown best in Fig. 17, said sprocket wheel being keyed to cam shaft 59 which is journalled in the frame 22.

A hopper 60 is carried by members 61 which are, in turn, connected by webs 62 to frame 22. Hopper 60 is of rectangular shape in cross-section and is open at its top to receive a plurality of cards 63 and hold them in a vertical stack 64. A flange 65 is positioned at the bottom of the hopper and extends along one side of the hopper whereby the stack is supported on that side of the hopper. The opposite side of the stack is

normally supported by a separator blade 66, which will be hereinafter more fully described.

Referring particularly to Figs. 9, 10 and 11, a transverse support 67 extends between opposite frame members 22 adjacent hopper 60. The support 67 is provided with slots 68 (Fig. 2), one adjacent each end thereof, whereby the support is horizontally adjustable toward or away from hopper 60, adjusting screws 68 securing the support to opposed ledges 69 carried by the frame members 22.

Upon an intermediate portion of the support 67 a card separator 70 is mounted. The separator 70 comprises a body or casting 71 which is secured by means of screws 72 to support 67. The casting 71 comprises a hollow cylindrical sleeve 73 through which a bolt 74 extends. Bolt 74 is normally stationary with respect to sleeve 73, being adjustable to a desired position with respect to said sleeve by means of the knurled nut 75 threadedly engaged upon the end of bolt 74, the nut being integral with a sleeve 76 which bears upon a spring (not shown) carried within sleeve 73.

Bolt 74 is rigidly secured to a cylindrical collar 77 and slidably mounted upon said collar is a sleeve 78. A projection 79 is formed integral with the slidable sleeve 78 and is adapted to slidably engage in a slot provided in the casting 71, as shown best at 80 in Fig. 10. In this manner sleeve 78 is constrained to move axially with respect to collar 77 and rotary motion of sleeve 78 with respect to collar 77 is prevented.

A member 81 is integrally formed upon sleeve 78 and extends laterally therefrom. A pin 82 is loosely positioned in the member 81 and a knurled nut 83 is threadedly secured to an end thereof. On the opposite side of the member 81, pin 82 is embraced by a coil spring 84, said spring being confined between member 81 and a bar 85 (Figs. 6 and 10) carried at the end of pin 82. An L-shaped bracket 86 is adjustably secured, by means of bolts 87, to the bar 85, the bracket being slotted, as shown best at 88 in Fig. 6. A plate 89 having a flange 90 is adjustably secured to the cross-portion of the bracket and blade 66 is also secured to said bracket, the plate 89 and blade 66 being secured by bolts or screws 91.

An abutment plate 92 is rigidly secured to the slidable sleeve 78 and is provided with a contact surface 93. A bearing bracket 94 is supported by the cross member 67 and a shaft 95 is rotatably journalled in the bracket 94, said shaft also being journalled in the casting 71. An arm 96 is rigidly secured to an end of said shaft and is adapted to make contact with the surface 93 of plate 92 when shaft 95 is rotated. A tension spring 97 is anchored at one end upon the plate 92 and at the opposite end to arm 96 said spring normally urging said two parts together.

The separator 70, in itself, forms no part of the present invention, and is described in detail only to indicate its function as used in conjunction with the present invention and thereby more clearly illustrate the present invention.

Referring particularly to Fig. 9 of the drawings, a cam 98 is rigidly secured to the cam shaft 59. A bell crank lever 99 pivoted upon shaft 100 is positioned adjacent the cam 98, one arm 101 of said lever carrying a roller 102 which functions as a follower for the cam 98. The other arm 103 of the lever 99 is pivotally connected as at 104 to link 105, the opposite end of which is pivotally connected to an arm 106 (Fig. 10) which, in turn, is rigidly secured to shaft 95.

The opposite portions of frame 22 have two rearward extensions 107 at the ends of which an anchor bar 108 is carried, the bar extending transversely across the frame of the machine. A coil spring 109 is anchored at one end upon bar 108 and at the opposite end is anchored upon pin 110 carried upon arm 103, the function of spring 109 being to urge the follower 102 into contact with the surface of cam 98.

As has been hereinbefore described, the stack 64 of cards 63 carried in hopper 60 is supported by flange 65 and blade 66. However, cards 63, as will be hereinafter more fully described, are removed in seriatim from the bottom of the stack 64. In order to effect such removal the blade 66 is withdrawn momentarily from its supporting position, as shown best in Fig. 9.

It can readily be seen that during the major portion of the revolution of cam 98, the follower 102 rides upon the circular portion of said cam and, hence, blade 66, during such phase of operation, is positioned in supporting relationship to the stack 64, as shown best in Fig. 6. In this position arm 103 of the bell crank lever 99 is moved to its limited counterclockwise position, as viewed in Fig. 6. With the arm 103 in this position, arm 106 is swung to its limited clockwise position, and, in turn, the contact arm 96 is swung away from the contact surface 93 of blade 92. When arm 96 swings to this position it exerts tension upon spring 97 and as a result sleeve 78 is moved to the right, as viewed in Fig. 6, until the end of said sleeve contacts abutment 111 carried upon the end of bolt 74.

It will be noted that the high point of cam 98 is rather "peaked," the peak spanning a relatively small angle of the revolution of the cam. When the peaked portion of cam 98 contacts follower 102, the arm 99 is rocked so as to move arm 103 into its limited clockwise position, as viewed in Fig. 9. With this motion, arm 106 is rotated in a counterclockwise direction and contact arm 96 moves into contact with the surface 93 of plate 92. This movement of arm 96 causes sleeve 78 to move to the left, as viewed in Fig. 9, and hence, blade 66 is momentarily removed from its supporting relationship with respect to stack 64.

It is to be understood that the movement of blade 66 is momentary and that the motion is a reciprocating one wherein the blade moves outwardly and inwardly very rapidly. With the assistance of auxiliary mechanism, which will be hereinafter more fully described, the blade 66 separates the lowermost card from the stack 64 and then resumes its supporting position with respect to the remainder of cards 63 in said stack.

To effect the removal of the lowermost card 63 from the bottom of the stack 64, a vacuum arrangement is employed. This arrangement comprises a "sucker" tube 112 having a mouth or open end 113 which opens in a plane substantially parallel to the plane of the lowermost card at the phase of operation just prior to removal of the card, that is, immediately after the separator blade has been withdrawn from supporting position with respect to the stack 64.

The tube 112 is carried by, and connects into, a hollow block 114 and a flexible tube 115, from a source of controlled vacuum, to be hereinafter more fully described, functions to establish a condition of vacuum within the block 114 and tube 112 during a predetermined period of operation. The block 114 is pivotally connected at 116, Fig.

5a, to an arm 117, hereinafter more fully described.

In operation, the mouth or open end 113 of the sucker tube 112 describes or traces a compound figure or path in the plane at right angles to the plane of the lowermost card 63 in the stack 64. Starting with the mouth 113 adjacent the lowermost card 63, said mouth first moves downwardly; thence backwardly; thence forwardly and upwardly to its original position immediately beneath the lowermost card of the stack. In describing this path the vacuum is controlled, as described hereinafter, to remove the card from the stack, deliver it to a positioning mechanism and release it.

The mechanism for imparting the vertical component of the motion of the mouth 113 will now be described.

Referring particularly to Figs. 5a and 7, a cam 118 is rigidly mounted upon cam shaft 59 adjacent cam 98. A rocking member 119 is pivotally mounted upon the pivot shaft 100 and comprises a hub having three circumferentially spaced, laterally offset arms. The arms comprise, follower arm 121 which carries follower roller 122, reaction arm 123 and operating arm 124. Reaction arm 123 is pivotally connected at its end, as at 125, to rod 126. The rod 126 is slidably positioned within a sleeve 127 which latter is pivotally connected to anchor rod 108, as at 128 in Fig. 7. A compression spring 129 embraces rod 126 and urges arm 123 in a clockwise direction, as viewed in Fig. 7, thereby maintaining follower 122 in contact with the surface of cam 118.

Operating arm 124 carries a slotted extension 130 which is secured thereto by bolt 131 and an internally threaded sleeve 132 is pivotally connected to the extension 130, as at 133 in Fig. 7. By means of the slot in the extension 130 the pivotal connection 133 may be adjusted to a desired position along the length of the extension.

Block 114 carries an extension 134 and a transversely extending lug 135 (Fig. 52) is pivotally mounted adjacent the end of said extension. A threaded link 136 is connected at one end to lug 135 and is threadedly connected at its opposite end to sleeve 132.

It can readily be seen that the mouth 113 is moved by the rotation of cam 118 in a substantially vertical direction, neglecting angularity, but, as will be hereinafter more fully described, this motion is compounded by the action of the pivot 116 of block 114 which is also movable. The instrumentalities for moving the pivot 116 will now be described.

Referring particularly to Figs. 5, 5a and 17, a cam 137 is mounted upon shaft 59, and a cam follower roller 138 is adapted to ride upon the surface of cam 137. The follower roller 138 is carried at the end of lever arm 139 which is pivotally mounted intermediate its length upon shaft 100. The opposite end 117 of lever arm 139 is pivotally connected, as at 116 in Fig. 5a, to block 114. A compression spring assembly is anchored at one end, as at 137', to anchor bar 108 and is connected at the other end to arm 117 whereby the follower 138 is maintained in contact with the face of cam 137.

It can readily be seen that as cam shaft 59 rotates, the arm 117 swings the pivot point 116 in a substantially horizontal direction as viewed in Fig. 5. This movement of the pivot point 116 imparts a horizontal motion to the tube 112.

It will be noted that the motion imparted to the mouth 113 of the tube 112 is the resultant of movements imparted by cams 118 and 137, said movements being superimposed upon each other, cam 118 moving the block 114 and, hence, the tube 112 about the pivot point 116 and the cam 137 moving the pivot point itself.

An arm 140 is rigidly secured to shaft 100 and a coil spring 141 is anchored at one end upon pin 142 mounted adjacent the end of the arm 140. The opposite end of the coil spring 141 is anchored upon hook 143 carried at the end of the extension 134. The coil spring 141 is normally in tension and functions to bias the connection comprising tube 132 and rod 136 against any "play" which may occur in the various pivotal connections.

A fourth cam 144 is secured to the cam shaft 59 and a follower roller 145 is adapted to ride upon the surface of said cam. The roller 145 is carried upon an end of bell crank lever 146 which is pivoted intermediate its length to the shaft 100, and roller 145 is maintined in contact with the face of cam 144 by tension spring 146' connected between anchor bar 108 and arm 146. The opposite end of the lever 146 is pivotally connected as at 147, Figs. 5 and 5a, to a pusher member 148. The pusher member 148 is supported intermediate its length upon a pair of oppositely disposed arms 149, only one of which is shown, the pusher member being pivotally connected at 150. The arms 149 at their opposite ends are loosely carried upon shaft 21.

Referring particularly to Figs. 24, 25 and 26, the structural details of the pusher member 148 will be described. The member 148 is substantially rectangular in shape having an extending portion 151 at the end of which lever 146 is connected, as has been hereinbefore described. Beneath the member 148 a plurality of electrical switches 152 are mounted upon a block 153 which, in turn, is mounted upon the lower face of the pusher member. Each switch 152 comprises a pair of arms 154 and 155 each of which carries a switch point 156. Electrical conductors 157 are connected to the switches 152 and are anchored in block 157 carried upon the lower face of the pusher member.

The opposite end of the pusher member 148 is provided with a relatively large central slot or recess 158 which opens at an end of the pusher member. Adjacent the recess 158 on each side thereof are a plurality of relatively narrow parallel slots 159. A lug 160 is mounted upon each opposite side edge of the pusher member and each lug extends downwardly therefrom. A plate 161 having opposite recessed corners 162 is pivotally connected, as at 163, to the lugs 160. The plate 161 has its rear face chamfered, as shown best at 164 in Fig. 26 whereby said plate may have limited clockwise motion about pivots 163, as viewed in Figs. 25 and 26. The forward portion of plate 161, that is, the portion remote from the pivots 163, is provided with a plurality of slots 165 corresponding in number and position to the slots 159.

A feeler arm 166 is positioned in each of the slots 165 and intermediate the length of said arms, said arms are all pivoted to the plate 161 by means of pivot rod 167. A strap 168 is secured adjacent its ends to the sides of the pusher member 148 by means of screws 169 and provides a depending sling for supporting ends 170 of the feeler arms 166. A head 171 is mounted upon the end of each feeler arm and is normally adapted to occupy a position in contact with the lowermost spring arm 155. The opposite end of

each feeler arm 166 terminates in a curved feeler tip 172 which projects into each respective slot 159 in the pusher member. A pair of arms 173 are rigidly mounted upon an intermediate portion of plate 161 and extend outwardly therefrom. At the ends of said arm a roller 174 is journalled. A leaf spring 175 is secured at one end, by screw 176, to the bottom of the pusher member and bears at its opposite end upon the lower face of plate 161, tending normally to urge said plate in a clockwise direction about pivots 163, as viewed in Fig. 25.

A pair of blocks 177 and 178 are mounted upon the top of the pusher member 148 adjacent the slotted end thereof, plate 177 extending from the side edge of the member to the defining side of recess 158 and the block 178 extending from the defining side of recess 158 to the opposite side edge of the pusher member. The forward edge 179 of each block 177 and 178 is arcuate in shape and joining the arcuate forward edges across recess 158 is a plate 180 which is arcuate in cross-section.

Between the plates 177 and 178 and the slotted end of the pusher member 148, a slot 181 is provided for the reception of the rear edge of a card 63, the forward end of said pusher member being tapered, as at 182' in Figs. 25 and 26, to facilitate insertion of the card into the slot 181, the tapered portion 182' acting in conjunction with the arcuate forward portion 179 of the blocks 177 and 178 and the curved plate 180 to facilitate this operation.

As has been hereinbefore described, the purpose of the present invention is to print in a sequential manner upon a moving tape, for example, information relevant, or common, to a predetermined sub-category of cards 63 maintained in the main card file or stack 64. In order to "key" the cards 63 for various categories or subcategories, the cards are punched adjacent one edge thereof, as shown best at 183 in Figs. 28 and 29.

For purposes of description, the machine described contemplates a maximum of 13 code punches. However, it is to be understood that more or less code punches may be employed by an obvious duplication or reduction in the instrumentalities to be hereinafter more fully described.

To employ the example hereinbefore set forth, the main card file or stack 64 may comprise the names and addresses, alphabetically arranged of automobile owners in the United States. These owners may be coded in various fashions, for example, as to the cars they own. For instance, Ford owners may be coded with a punch 182 at the 13th station of the card, as shown in Figs. 28 and 29. Running such cards through the machine would furnish a sequentially printed list of all Ford owners in the United States. However, it may be desired to break down this category further. The punch station 1 may indicate a predetermined State such as Illinois. A further break down may be made if punch station 3 referred to Cook County. Hence, were cards 63 run through the machine with the three stations 1, 3 and 13 punched and the machine set, as hereinafter described, to select these stations, a list of Ford owners in the State of Illinois and county of Cook would be printed, the list still preserving its alphabetical relationship.

The cards 63 may be constructed of paper or cardboard or other flat stiff material. The printing side of the card carries the desired information to be printed and such information is set forth in reverse, as shown at 183 in Fig. 29. The letters spelling out the information may be formed of a transferable ink deposited in a predetermined amount, the ink being soluble in water or other liquid. Hence, when a moistened sheet is brought into contact with the printing side of the card, the information 183 will be transferred to the sheet in inverted manner, that is, it will print the information forwardly. For ease in identification, the face of the card may contain the printed information 183 printed in forward manner, as at 184 in Fig. 28.

Reverting to Figs. 24, 25 and 26, a card 63 inserted in slot 181 with the punched portion inwardly will present to the various feeler tips 172 of the feeler arms 166 either a punched hole 182 or unpunched card stock. As will be hereinafter more fully described, a cam 185 carried upon shaft 26 periodically rotates into contact with roller 174. Switches 152 are normally open, that is, switch points 156 are separated. When the roller 174 is moved by cam 185, plate 161 is swung in a counterclockwise direction about pivots 163, as viewed in Figs. 25 and 26. Pivot rod 167, and hence feeler arms 166 are moved upwardly, all of the feeler tips moving upwardly. If an unpunched portion of card 63 is encountered by any of the feeler tips 172, the upward movement of said feeler tip is halted. However, roller 174, arms 173 and pivot rod 167 continue to move upwardly and the feeler arm 166 corresponding to the halted feeler tip, rocks about pivot rod 167 in a clockwise direction relative to plate 161, as viewed in Figs. 25 and 26. This motion brings the corresponding head 171 into pressure contact with the lower switch arm 155 causing contacts 156 to close.

If, on the other hand, the feeler tip 172 encounters a punched hole 182 the feeler tip moves upwardly in step with the movement of roller 174, arms 173 and pivot rod 167 and, hence, no rocking movement of the corresponding feeler arm 160 takes place about pivot rod 167 and switch points 156 remain open.

Thus it can be seen that in response to the presence or absence of a punched hole 182 in a predetermined card 63, predetermined switches 152 remain open or are closed. The proper selection of cards is thus made inasmuch as switches 152 function in conjunction with an electrical circuit which controls the printing or omission of printing of the various cards as they pass through the printing station, as will be hereinafter described.

A shelf 186 is mounted beneath the table top 3 and is supported by the legs 2. A vacuum pump 187 is mounted upon the shelf 186, said pump having a discharge 188 and an intake 189. The vacuum pump 187 is of the usual rotary type having a shaft 190 upon which a pulley 191 is mounted. An endless belt 192 is trained around pulley 191 and is also trained around a pulley (not shown) mounted upon motor shaft 7, the vacuum pump thus being driven by the motor 4. A pipe 193 connects the intake 189 to a tank 194 and a pipe 195 connects the tank 194 to cylinder 196. The function of the cylinder 196 is to filter the air drawn into the vacuum pump and also to impregnate said air with oil vapors. A pipe 197 connects cylinder 196 to a flexible hose 198.

Cam shaft 59 extends beyond frame 22 and a block 199 is mounted by means of screws 200 upon the outer portion of the frame 22 adjacent

the extension of shaft 59. A casting 201, Figs. 19, 20, 22 and 23, is mounted upon the block 199, said casting having a bore 202 which connects into the end of the flexible conduit 198. The bore 202 connects into a transverse bore 203 within the casting 201, said latter bore opening to the face of the casting. The casting 201 is provided with a second bore 204 which connects into the flexible conduit 115 which, in turn, connects into block 114 upon which the sucker tube is mounted. Within casting 201 the bore 204 connects with a transverse bore 205 which opens to a face of the casting. The casting 201 is also provided with a transverse bore 206 which extends through the thickness of the casting and opens at both faces thereof.

The projecting end of the cam shaft 59 extends transversely through the casting 201, said casting functioning as an additional bearing support for the shaft 59. A plate 207 is adapted to be carried upon the end of shaft 59, said plate being centrally recessed, as at 208 in Fig. 20, for the reception of said shaft end. Two diametrically oppositely disposed pins 209 are mounted upon the end of shaft 159 and are adapted to engage in corresponding recesses in plate 207. The inner face of the plate 207 is provided with an arcuate groove 210 which, as will be hereinafter more fully described, is adapted to connect bores 203 and 205 during a predetermined portion of the revolution of shaft 59. A housing 211 is mounted upon the face of casting 201 and functions as a cover for the end of shaft 59 and plate 207 carried thereon. A coil spring 212 is confined within said housing and bears upon the outer surface of plate 207 thereby firmly seating said plate in an air tight manner upon the surface of casting 201.

In operation, shaft 59 rotates in a counterclockwise direction as indicated by the arrows in Figs. 19 and 23. As shaft 50 rotates, plate 207 is carried around therewith, said plate sliding upon the surface of casting 201. During a portion of the revolution of shaft 59, groove 210 in the face of plate 207, bridges the bores 203 and 205 thereby effectively connecting conduits 115 and 198 and establishing a condition of vacuum in the block 114 and sucker tube 112. This phase of the operation is illustrated in Fig. 19. As the shaft 59 continues to rotate, groove 210 moves away from bore 203, disconnecting conduits 115 and 198. Shortly thereafter groove 210 bridges bores 205 and 206 thereby breaking the vacuum in conduit 115 and in the sucker tube 112. This phase of operation is illustrated in Fig. 23.

The operation described in conjunction with the vacuum valve is correlated and timed with the movement of the sucker tube 112. When the mouth 113 of the sucker tube 112 moves to its closest position beneath the stack 64 of cards 63, groove 210 just commences to bridge bores 203 and 205 and a condition of vacuum is established at the mouth of the sucker tube. At this period of operation the separator blade 66 is withdrawn from its supporting position beneath said stack whereupon the mouth of the sucker tube grasps the unsupported edge of the lowermost card 63. This position of operation is best illustrated in Fig. 9. As the operation is continued, the mouth 113 of the sucker tube moves downwardly, as illustrated best in Fig. 5, carrying with it the lowermost card 63. At this period of operation, the groove 210 is bridging the bores 203 and 205.

After a predetermined downward movement of the mouth 113, it will be noted that the flanges 35 and 36 carried upon collars 33 and 34 respectively which are mounted at the ends of shafts 30 and 32 respectively, rotate to a position above the opposite edge of the card 63 being carried by the sucker tube. This phase of the operation is best illustrated in Fig. 7. It will be noted that shortly thereafter the flanges 35 and 36 contact the upper portion of the card being carried by the sucker tube. At approximately this phase of operation, the plate 207 has moved to a position whereby groove 210 ceases to bridge bores 203 and 205, and shortly thereafter the vacuum in the sucker tube is broken. However, simultaneously, the flanges 35 and 36 bring the opposite edges of the card 63 into contact with cooperating rollers 213 and 214. This phase of the operation is best illustrated in Fig. 6. It will be noted that the end edge portions of the card formerly held by the mouth 113 of the sucker tube is then confined between the outer surfaces of the arcuate flanges 35 and 36, and the surfaces of rollers 213 and 214, respectively. The collars 33 and 34, and the rolls 213 and 214 rotate in opposite angular directions as indicated by the arrows in Fig. 6.

With the card 63 confined in this manner, the rear edge of said card is inserted into the slot 181, such insertion being facilitated by the configuration of the elements constituting the forward end of the pusher member 148. It will be noted that the rearward movement of the card 63 between the flanges 35 and 36 and rollers 213 and 214 respectively, continues only so long as the outer surfaces of the flanges are in tangent relationship to the rollers 213 and 214. Thereafter, the card is positioned within the slot 181 and the forward edge of said card has dropped from the flange 65 at the lower portion of the hopper 60, the card falling to the surface of a platform 215.

It will be noted that shortly after the lowermost card is gripped by the mouth 113 of sucker tube 112, the separator blade 66 returns to its supporting position beneath the stack 64. It will also be seen that after the vacuum in the tube 112 is broken and the flanges 35 and 36 take control of the card, the sucker tube is withdrawn rearwardly from the zone of separation and subsequently is brought to its initial position beneath the lowermost card of the stack. It will also be seen that as the card is pinched or confined between the flanges 35 and 36 and the rollers 213 and 214, cam 185 carried on shaft 26, the shaft which carries rollers 213 and 214, has moved to a position whereby it contacts roller 174, initiating the feeling or selecting action accomplished by the arms 166. When the card has arrived at this position and the parts are in this relationship, the card is ready to be delivered to the printing station.

Referring particularly to Fig. 16, a rubber roll 216 is mounted upon shaft 43 between the opposite frame members 22. The frame members 22 are provided with opposite apertures 217 through which the ends of shaft 43 extend, the shaft being journalled in bearings 218 and 219. Bearing 218 is carried upon a swingable bar 220 (Figs. 3 and 4) which is pivotally mounted at 221 upon frame member 22. A housing 222 is mounted upon frame member 22 and carries a supporting plunger 223 upon which bar 220 and bearing 218 are supported, plunger 223 being spring-pressed by spring 224 carried within housing 222. Similarly, bearing 219 is carried upon a pivotally

mounted bar 220' similar to bar 220, idler gears 38 and 40 being journalled upon said bar. An assembly 225 similar to the floating support 222, 223 and 224 carries the bearing 219 and the bar 220' upon which it is mounted. In this manner roll 216 is supported in a "floating" position.

It will be noted that shaft 45 is positioned immediately above shaft 43 which carries roll 216. Shaft 45 is journalled in bearings 226 and 227 at opposite sides of the frame 22. Bearing 226 is carried by bar 228 (Figs. 3 and 4) said bar being pivotally mounted upon the frame 22 at 229. Bearing 227 is carried by a bar 228' similar to bar 228, said bar being pivotally connected to the opposite frame member 22. The bar 228' which carries bearing 227 also carries idler gears 39 and 41. A tube 230 is mounted upon frame member 22 above bearing 226, said tube carrying a coil spring 231 which bears upon plunger 232 which, in turn, bears upon the upper portion of bar 228, urging said bar downwardly in a clockwise direction about pivot 229, as viewed in Fig. 4. A similar spring pressed agency, designated generally at 233 in Fig. 16, bears upon the upper portion of bearing 227 and, consequently, shaft 45 is normally resiliently urged toward roll 216.

A drum 234 comprising a cylindrical outer surface 235 joined by end members 236, is mounted upon an intermediate portion of shaft 45, the end members 236 having hubs 237 which are "keyed" to shaft 45. The drum 234 is preferably rubber covered and is positioned immediately above roll 216 and is urged into contact with said roll by means of the resilient members which act upon the bearings 226 and 227.

The opposite frame members 22 are provided with relatively enlarged apertures 238 through which the shaft 45 passes. A pair of rollers 239 having cylindrical sleeve extensions 240 are journalled in apertures 238, and the surfaces of the rollers 239 are adapted to ride upon the edge portions of roll 216.

The roll 216, drum 234 and rollers 239 together constitute the printing station and, as will be hereinafter more fully described, cards 63 are passed in sequence to the printing station. During passage of the cards their opposite edge portions are confined between rollers 239 and roll 216. When it is desired to print from the information contained upon the card, drum 234 is maintained in its lower position with respect to drum 216, the card and web upon which the information is to be printed being confined between roll 216 and drum 234. However, when a card from the main file is not to be used for printing purposes, that is, a card which is not in the selected sub-category, shaft 45 is raised by swinging bearings 226 and 227 upwardly, the swingable motion of the bearings being accomplished by moving the bars upon which said bearings are mounted.

It will be noted that the rollers 239 are provided with relatively large central apertures 241 in which the shaft 43 and hubs 237 are positioned. This arrangement permits limited movement of shaft 45 and drum 234 upwardly with respect to roll 216. However, it will be noted that whether drum 234 is in its lowered position with respect to roll 216 or whether it is in its upraised position, rollers 239 remain in their tangent position with respect to the roll 216. Consequently, whether a selected or non-selected card passes through the printing station, the card is positively moved through the station by the co-action of the rollers 239 and roll 216; the roll 216, of course, being a driving roll, as has been hereinbefore described.

Referring particularly to Figs. 3 and 4, a solenoid 242 carried by frame 243 is mounted upon the main frame 22 of the machine. A plunger or core 244 is slidably positioned within the solenoid 242, said plunger being connected to a rod 245. A lever 246 is pivoted intermediate its length upon frame 22, as at 247. One end of lever 246 carries a pin 248 which is pivotally connected, as at 249, to the end of rod 245. The opposite end of lever 246 is positioned immediately beneath the free end of bar 228 upon which bearing 226 is carried. As will be hereinafter more fully described, when a non-selected card passes through the printing station, the solenoid 242 is energized thereby pulling rod 245 downwardly, causing the opposite end of lever 246 to raise bar 228 and move drum 234 to its upper position. When a selected card passes through the printing station, however, the circuit to the solenoid 242 is broken and bar 228 moves downwardly under the impulse of spring 231 and the corresponding spring contained in the unit 233. This action causes rod 245 to move downwardly bringing plunger 244 into its inoperative position within the solenoid 242.

A pair of frame members 250 are mounted on opposite sides of the frame 22, each member 250 having a pair of arms 251 and 252. A supply roll of paper 253 is carried upon a shaft 254 journalled at the ends of arms 251 and a web 255 of said paper is drawn from said roll and carried around drum 234, said web being slightly narrower in width than the length of the drum so that said web will not extend over the surfaces of either of the rollers 239.

The web 255 after passing around drum 234 passes over web tensioning roller 256 and is wound upon roll 257. Roll 257 is a conventional take-up roll and is rigidly mounted upon an extension of shaft 55.

It can be seen that the web 255 in passing from the supply roll 253 to the take-up roll 257, passes through the printing station, that is, it passes between roll 216 and drum 234. At the printing station cards 63 also pass with the reverse printed side thereof facing the web, as shown diagrammatically in Fig. 27, whereby the printing 183 of a selected card is transferred to the surface of the web, as shown at 258 in said figure. Previous to entering into transfer relationship with the selected card, the surface of web 255 is wetted with a solvent for the ink employed in inscribing the reverse printing 183. The mechanism for wetting the web at the time of passing a selected card through the printing station will now be described.

Referring particularly to Figs. 12, 13, 14 and 15, a tubular housing 259 is mounted transversely across frame members 22 adjacent drum 234. The tubular housing 259 is carried on one frame member 22 by a support 260 which comprises the continuation of a hollow pipe 261 positioned within the housing. The pipe 261 at its opposite end is connected by coupling 262 to a tubular extension of a solenoid operated pump 263. The pump 263 carries a solenoid coil 264 and has a hollow cylindrical interior 265 in which a piston plunger 266 is slidably positioned. A pin 267 having a conical end 268 is carried by the piston 266 and extends into the tubular extension of the pump 263, pipe 261 having its end conically formed, as at 269, to provide a seat for the conical end 268 of pin 267. The pump 263 carries a

head 270 threadedly secured to the cylinder of the pump, the head being provided with a bore 271 which connects into a tube 272 positioned within the cylinder 265. A coil spring 273 is confined between the head 270 and the piston 266 and embraces tube 272.

A bracket 274 (Fig. 16) is mounted upon frame 250 and is adapted to support cup 275. Cup 275 is adapted to contain a quantity of a liquid, which may be water, alcohol or other solvent for the ink comprising the letters or indicia 183 upon the cards 63. Cup 275 is of the conventional construction employed in the usual oil cups, having a sight glass 276 positioned in the nipple 277 connected at the bottom of the cup. A control valve (not shown) is positioned within cup 275, being operated by lever 278. A flexible tube 279 connects the nipple 277 to the pump 263 through the bore 271 whereby solvent liquid is delivered from cup 275 to pump 263.

Referring again to Figs. 12, 13 and 14, an absorbent wicking 280 is positioned within the lower portion of the tube 259, a portion of said wicking extending outwardly from the tube throughout the length thereof and being in contact with the surface of the web 255 which is adapted to contact the print 183. The wick 280 extends through an elongated opening in tube 259 defined by flanges 281. Within the tube 259 pipe 261 is provided with a plurality of apertures 282 which are of progressively increasing size with respect to their distance away from the inlet end of pipe 261. At the end of the tube 259 an outlet pipe 283 is connected, said pipe functioning as a relief opening to prevent pressure within the tube 259 from excessively wetting the surface of the web 255.

As will be hereinafter more fully described, piston 266 is operated magnetically at periodic intervals related to the movement of the web 255 to wet adequately the web surface so that a desired transfer of ink from the letters 183 to the web may be effected.

Instead of the mechanism hereinbefore described for moistening the web, an arrangement for moistening the web such as described in the copending patent application of Ernst C. Sauerman, Serial No. 31,338, filed June 5, 1948, upon Feeding Device for Sheet Material and Sheet Material Element Used Therewith may be employed.

Referring particularly to Figs. 1, 2 and 16, as has been hereinbefore described, gear 44 is loosely mounted upon shaft 45, said gear being continuously rotated during the operation of the machine. However, web 255 is moved only when selected cards are passed through the printing station, that is, when cards to be printed from are passed through said station. At all other times the web 255 remains stationary, and hence shaft 45 remains stationary.

When, however, a selected card passes through the printing station shaft 45 is rotated and web 255 moves, the rotation of the shaft being accomplished by the electric circuit with which the feeler switches 152 are associated.

Gear 44 carries a sleeve extension 284 which is rigid, or may be integral, with said gear, said sleeve loosely embracing shaft 45. A collar 285 is mounted upon sleeve 284, being locked thereon by set screw 286. The outer end of collar 285 carries ratchet teeth, as shown best at 287 in Fig. 2 which face and are adapted to engage similar teeth carried upon a slidable clutch collar 288 mounted upon shaft 45. The opposite end of clutch collar 288 is provided with apertures 289 into which guide pins 290 are slidably positioned, said guide pins being carried upon the face of collar 291, said collar being keyed to shaft 45. A coil spring 292 embraces a portion of collar 291 and clutch collar 288 and functions to urge collar 288 away from collar 291.

Clutch collar 288 is provided with an annular groove 293 in which opposite prongs 294 of yoke 295 ride, the arrangement being such that movement of the yoke 295 moves clutch collar 288 out of engagement with collar 285 to disconnect the rotating gear 44 and shaft 45. Clutch collar 288 is normally urged into engagement with collar 285 by means of spring 292.

A solenoid 295' is mounted upon frame 22 adjacent shaft 45 and an armature 296 is pivotally mounted between the solenoid and said shaft. Armature 296 carries yoke 294 at its end whereby disengagement of the clutch collar 288 from collar 285 is brought about by energization of the solenoid 295. Hence, as will be hereinafter described in conjunction with the description of the electrical circuit employed in the invention, the feeler switches ultimately control the movement of paper web 255.

As has been hereinbefore described, sprocket wheel 54 is loosely mounted upon shaft 55 and is continuously driven by sprocket chain 53 while the machine is in operation. A plate 297 (Figs. 2 and 16) is rigidly mounted upon sprocket wheel 54, said plate carrying a clutch facing 298, both the plate and clutch facing carried thereon being rotated by sprocket wheel 54. A pressure plate 299 is keyed to shaft 55 and is slidable axially, but non-rotatably mounted on said shaft. A coil spring 300 embraces the end of shaft 55 and is confined between pressure plate 299 and a collar 301 which is rigidly mounted upon the end of the shaft, spring 300 being normally under compression and functioning to urge plate 299 toward the facing 298.

A yoke 302 engages the pressure plate 299 and functions to move said plate axially along shaft 55, said yoke being carried by rod 303 which is journalled in bracket 304 mounted upon the frame 250. Rod 303 is bent at right angles to itself to form an arm 305 which is pivotally secured at its end to link 306. A lever 307 is pivotally mounted at an intermediate portion to frame 250, as at 308 (Fig. 2). One end of lever 307 is pivotally connected to link 306 and the opposite end is pivotally secured to the web tightening roller 256.

The operation of the mechanism hereinbefore described is as follows: Chain 53 drives sprocket wheel 54 which, in turn, drives plate 297 carrying the friction facing 298. By virtue of the compression of spring 300, pressure plate 299 engages facing 298 and, hence, shaft 55 is rotated causing the take-up roll 257 to revolve. Revolution of the take-up roll tends to pull web 255 through the printing station. However, if drum 234 is in its upraised position it cannot be readily rotated and, hence, web 255 will be vigorously tensioned. The tensioning of web 255 tends to move web tightener roller 256 downwardly and, hence, lever 307 is rocked, rocking rod 303 and moving pressure plate 299 against the compression of spring 300. In this manner, rotation of shaft 55 is stopped and the tension upon web 255 is relieved.

If, on the other hand, drum 234 is in its lowermost or printing position, it will rotate tending to cause slack in the web 255 between said drum and the take-up roll 257. Spring 300 then func-

tions to move pressure plate 299 in its engaged position causing take-up roll to rotate and take up said slack until the force exerted upon roller 256 again causes the overpowering of spring 300. This cycle of action repeats itself during the operation of the machine.

Instead of employing the clutch mechanism hereinbefore described for taking up the slack of the web after it passes through the printing station, a mechanism for accomplishing this function similar to that shown and described in the copending patent application of Ernst C. Sauerman, Serial Number 31,338, filed June 5, 1948, upon Feeding Device for Sheet Material and Sheet Material Elements Used Therewith, may be employed. In employing the arrangement an extensible belt (not shown) preferably an endless coil spring will couple drums 253 and 257 together, a larger pulley being associated with drum 253 than the pulley associated with drum 257, in the manner set forth in the application for patent hereinbefore referred to.

Before describing the operation of the electrical control system, certain of the electrical instrumentalities not heretofore explained will be described. A relay box 309 is positioned upon shelf 185 and contains a relay coil which operates a single pole single throw switch (a holding switch for the relay), and a single pole double throw switch which may be designated an operating switch. Other instrumentalities may be contained in said box, such as, resistances for the various solenoid coils and if the system is operated by direct current, suitable transformer and rectifier elements may be contained therein so that the usual commercial alternating current can be used in rectified form at reduced voltages. A cable 310 containing appropriate conductors may connect said box to the other electrical instrumentalities of the machine.

A switch box 311 may be mounted upon the frame of the machine and may contain a plurality of single pole single throw locking switches of the push-button type, the switches being normally open and being closed by the depression of selected buttons 312. For purpose of illustration, thirteen such switches are employed and are numbered from one to thirteen, consecutively, as illustrated best in Fig. 2, the endmost button 313 being a reset button which mechanically functions to release all buttons 312 which have previously been pressed.

It will be noted that the number of buttons 312 correspond to the number of feelers 156 and the number of punch holes which may be made in a card 53. The operation is such that by depressing predetermined buttons 312, cards having corresponding predetermined punch holes 182 will be selected for printing. Conductors 314 connect the switches within box 311 to other electrical instrumentalities upon the machine.

Referring particularly to Figs. 17, 18 and 20, a pair of cam operated switches 315 and 316 are mounted upon block 199 adjacent the end of cam shaft 59. A pair of cams 317 and 318 are mounted upon shaft 59 and function during rotation of said shaft through the agency of lever-followers 319 to operate switches 315 and 316 respectively. Switch 315 will be hereinafter referred to as a cam holding switch and switch 316 will be referred to as a cam operating switch. The primary function of a cam holding switch is to cyclically break the relay holding circuit and the primary function of the cam operating switch 316 is to control the circuits in which the various solenoids 242, 264 and 295 are connected, as will be hereinafter more fully described.

In describing the electrical selecting system reference will be made particularly to Fig. 30. The elements of the schematic Fig. 30, where said elements have hereinbefore been shown and described in their concrete form will be referred to by corresponding primed numerals. Otherwise, new reference numerals will be applied.

The reference numeral 320 designates the source of electrical power, the terminals being arbitrarily designated "plus" and "minus." Solenoid 242' is connected to the positive side of the line through an appropriate resistance 321 whereby to permit the passage of a predetermined current through said solenoid. Clutch operating solenoid 295' is also connected through resistance 322 to the positive side of the line. Condensers 323 and 324 are respectively connected in parallel with coils 242' and 295' to provide a shunt for the high voltage current which may be induced in the respective coils when the circuit to said coils may be broken, thus preventing sparking at the switch points of switches connected to said coils.

The circuit through said coils is completed through operating cam switch 316' or through one pole of a single pole double throw relay switch 325. It will be noted that when cam switch 316' is opened and when switch blade 326 is in contact with pole 327 (the relay coil being de-energized) the solenoid circuit is completed.

The relay switch 325 is operated by coil 328 which is in series with the selector circuit, designated generally at 329 in Fig. 30. The selector circuit 329 consists of a series-parallel circuit comprising the feeler switches which are normally open and selector switches 330 which are normally opened and may be closed by depressing one or more of the buttons 312.

A second switch 331 is operated by relay coil 328, said switch being a holding switch for the coil, the circuit being completed through cam switch 315'. Switch 331 functions to hold the relay coil circuit closed for a predetermined period of time determined by the cam switch 315' after the selector circuit 329 is opened.

In the operation of the circuit described thus far, coil 242' is normally energized, that is, drum 234 is held in its upraised position. Solenoid 295' is normally energized, that is, the clutch member 288 is disengaged from the collar 285 and shaft 45 is thereby maintained stationary. This condition of operation assumes that the circuit of the coils 242' and 295' is completed either through cam switch 316' or through relay switch 325. It is assumed, for purposes of illustration, that the circuit is closed through cam switch 316', which implies that lever-follower 319 for switch 316 is riding on a high portion of cam 318. When the follower 319 reaches a low portion of cam 318, the cam switch 316' is opened and solenoid coils 242' and 295' will be de-energized and drum 234 will drop and shaft 45 will turn, that is, a printing operation will take place, unless, however, the circuit of the relay coil 328 is open, in which case the circuit of coils 242' and 295' will be closed through the arm 326 and pole 327 to the negative side of the line, and, hence, drum 234 will remain upraised and shaft 45 will remain stationary. Thus, for each rotation of cam shaft 59 one card will pass the printing station and said card will be used to print from or will pass without such use being made thereof.

Hence, it is clear that if a selected card passes, the card must function to close the circuit of relay coil 325, and a non-selected card must function to maintain said circuit in its normal open condition.

As has been hereinbefore described, feeler switches 152' are normally open and are closed only when the feeler tips 172 of the respective feeler arms encounter the thickness of a card 63 in slot 181. Consequently, whenever a punch hole 182 is encountered by a feeler tip, the corresponding switch 152' remains open. As has been hereinbefore described, switches 330 are all normally open, and to make a predetermined card selection, a predetermined switch or switches 330 must be closed. Hence, during the forward movement of the pusher element 148, if a card carried by the pusher contains punch holes corresponding to the depressed buttons 312, the selector circuit 329 will be closed since the selector circuit will be completed through the switches 330 which are closed and through the feeler switches 152' which are closed by virtue of contact of the feeler tips 172 with card thicknesses in the slot 181. The coil 328 having its circuit completed, will move arm 326 of relay switch 325 to contact with the negative side of the line, and hence, the circuit of coils 242' and 295' will be broken through both the cam switch 316' and the relay switch 325. Accordingly, the card which has initiated this operation will be printed from.

If cards carried by the pusher have punch holes which do not correspond with the closed switches 330, the selector circuit 329 will be opened by one or more of the feeler switches 152'. Hence, solenoids 242' and 295' will be energized by virtue of the completion of the circuit through arm 326 and pole 327 of relay switch 325. If cards are carried by the pushed member which have no punch holes at all, the circuit of relay coil 328 will be closed and, hence, coils 242, and 295' will be deenergized and a printing operation will take place. However, it is assumed that in most instances the cards 63 of the main file 64 will have one or more punch holes which will function to permit the switches 330 to exercise a selected operation. If, however, it is desired to incorporate in the printed list upon switch 255, information which may be common to any category selected, such information will be contained upon a card 63 which has no punch holes whatsoever, in which case these cards will be printed from regardless of what additional selection may be made.

A double pole double throw switch 232 comprises a portion of the electrical circuit and is employed in operating solenoid 264. Coil 264' is connected across the center poles of switch 332 and two corresponding outer poles are connected through resistance 333 to the positive side of the line. One of the remaining outer poles is connected directly to the negative side of the line and the remaining outer pole is connected to the negative side of the line through one pole of switch 325 when arm 326 is in contact therewith, that is, when relay coil 328 is energized.

Switch 332 is normally in such position that the central poles thereof are connected with the pole which leads to resistance 333 and the pole which leads to relay switch 325. Hence, whenever relay 328 is energized, that is, when a selected card comes into the printing station, the circuit of solenoid 264' is closed and, consequently, plunger 266 is moved thereby injecting the solvent liquid in the cylinder 265 into the pipe 261, hence, wetting the wick 280 which prepares the web 255 for transference of the ink upon the card passing through the printing station to the surface of the said web.

Switch 332 may also be manually operated by means (not shown) so that connection may be made manually between the center poles of the switch directly to the line through resistance 333. This manual operation of switch 332 would normally be resorted to only when starting up the machine so as to properly prewet the wick 280 prior to the passage of a selected card through the printing station.

It will be noted from Fig. 26 that the duration of the feeling operation performed by the feeler tip 172 is relatively short and that during the period of the feeling operation the card has not as yet been delivered to the printing station. This is clearly brought out in Figs. 5, 6 and 8. The timing of the mechanism is such that cam switch 316' is closed during the feeling operation. Similarly cam switch 315 is also closed. Hence, if during the feeling operation the relay coil 328 is not energized, the circuit to coil 242' and 295' will remain complete even after cam switch 316' opens, since the circuit is completed through arm 326 and pole 327 of relay switch 325.

However, if the feeling operation results in the energizing of relay coil 328, the relay holding switch 331 closes. Inasmuch as cam switch 315' at this period is closed, the instantaneous closing of the relay holding switch 331 by the appropriate feeler switch or switches 152, will tend to maintain the relay coil 328 in an energized condition. This condition therefore exists when the cam switch 316' opens and, consequently, when the cam 316' opens, coils 242' and 295' are de-energized. At this period the selected card is at the printing station and the printing operation takes place.

To describe the complete operation of the machine thus far explained, a plurality of cards 63 are stacked in the hopper 60. The machine is started into operation and in order that the wicking 280 will be properly prepared to wet the surface of the web 255 when a selected card passes through the printing station, switch 332 may be manually operated in order to inject a quantity of solvent liquid into the tube 259. Initially the stack 64 of cards 63 are supported at the bottom of the hopper by flange 65 and separator blade 66. As the operation proceeds, cam 98 through arm 99 and link 105 retracts the separator blade 66 from its supporting position with respect to the lowermost card 63. The mouth 113 of the sucker tube 112 is then positioned immediately beneath the lowermost card 63. At this period vacuum is established in the tube 115 and the sucker tube grips the lowermost card 63.

Cams 118 and 137 then function through the various associated follower mechanisms, arms and levers to move the sucker tube 112 downwardly until the card is positioned in the path of flanges 35 and 36 carried upon the collars 33 and 34, respectively. The vacuum is then broken and the sucker tube releases the card. The card is then moved by flanges 35 and 36 into slot 181 of the pusher member 148. In the meantime, the sucker tube moves rearwardly and thence upwardly to its original position, and cam 144 acts to move the pusher member 148 forwardly.

During the forward motion of the pusher member 148, cam 185 contacts roller 174 which initiates the feeling operation hereinbefore de-

scribed, the feeling operation functioning to maintain predetermined switches 152 open as determined by the punch holes 182 in the card 63 carried by the pusher member. As has been hereinbefore described, appropriate push-button switches 330 are closed and, hence, if the card carried by the pusher member contains punch holes which correspond to the closed switches 330, the selector circuit 329 is closed. The closing of the selector circuit and, hence the circuit to relay coil 328, does not immediately initiate the printing operation. This operation is delayed through the action of cam switches 315' and 316' until the card moved forwardly by the pusher member is at the printing station.

In the printing station the drum 234 is normally maintained in its upraised position, that is, in the non-printing position. When, however, cam switch 316' opens, the effect of relay coil 328 being energized is to de-energize the lifting solenoid 242' and the clutch solenoid 295'. The drum 234 then moves downwardly to printing position and the web 255 is moved through the printing station in company with the selected card 63 and the typed information 183 is thus transferred to the web 255, as shown diagrammatically at 258 in Fig. 27.

As has been hereinbefore described, if a non-selected card 63 is carried forwardly by the pusher member 148, upon the opening of cam switch 316' the circuit to solenoid 242' and 295' are maintained in closed position by virtue of the contact of arm 326 with pole 327 of switch 325 and, hence, drum 234 remains in its upraised position and web 255 is maintained stationary.

However, it will be noted that whether a selected card or a non-selected card pass through the printing station, said card is gripped at its end portions by the rollers 239 and the drum 216, and the card, whether selected or non-selected, is positively passed forwardly.

Referring particularly to Figs. 2, 3, and 5, the shaft 48 is journalled in the frame 22, said shaft carrying a pair of conveyor pulleys 335, only one of which is shown. An endless belt 336 is trained around each of the pulleys 335, only one of which is illustrated. At the end of the machine a second shaft 337 is journalled, said shaft carrying a pair of pulleys 338 corresponding to the pulleys 335, over which the belts 336 are trained.

A hopper 339 is mounted upon frame 22 immediately above shaft 337, said hopper having an open side which faces the belts 336. A roller 340 is carried upon an intermediate portion of shaft 337 between belts 336, said roller having a scalloped periphery.

The timing of the machine is such that the cards in passing to the printing station are in slightly overlapped relationship. Of course, it is to be understood that the cards may be introduced to the printing station and discharged therefrom in non-overlapping relationship. However, in view of the fact that the critical period of the movement of the cards through the printing station is determined by the number of lines of print 183, it can be seen that the cards can be overlapped a predetermined degree limited only by the number of lines of printing or, as has been hereinbefore described, the cards may be entirely non-overlapping.

However, for purposes of illustration the cards are shown in slightly overlapping relationship since, for purposes of speed and efficiency it is advisable to have the cards travel as closely together as possible. The cards in their overlapping relationship are deposited in seriatim upon the surfaces of the moving belts 336, and are transferred by said belts to the hopper 339. It will be noted that as the cards move into the hopper said cards travel over the surface of the roll 344, which is of such diameter that its surface projects above the upper plane of the belts. The cards are moved by the belt over the roll 340 and are thus moved into the hopper 329 with their forward edges supported by flange 341. In this manner a stack 342 of cards is accumulated in the hopper 339, the cards being continuously fed to the bottom of the stack. By virtue of the scalloped periphery of roll 340, the stack 342 is vibrated, thereby preventing the cards from binding in the hopper 339.

As a feature of the invention it will be noted that the cards are removed from the bottom of one stack 64 and sequentially deposited at the bottom of another stack 342. Consequently, the cards in the stack 342 occupy the same relative position with respect to each other as the cards in the stack 64, although the stack as a whole is inverted. In other words, if the cards are maintained in an alphabetical order in the stack 64, such order will be preserved in the stack 342 although the sequence will be reversed.

We claim as our invention:

1. A machine for sequentially printing data carried by cards selected from a file of cards including said selected cards which comprises, a hopper for holding said file of data-bearing cards, the data carried on a face of each of said cards being transferable to the face of a web, a printing station, comprising a bed roll, a pair of spaced rollers above said bed roll in pressure contact with said bed roll adjacent its ends, means for moving the cards of said file between said bed roll and said rollers in seriatim, a drum positioned above said bed roll between said rollers around which a web is adapted to pass, means for urging said drum into printing pressure contact with said bed roll when predetermined cards of said file pass through the printing station, means for moving said web to present a fresh surface in response to the passage of said predetermined cards, and means for maintaining said drum in upraised position away from said bed roll when all other cards from said file pass through said printing station, whereby only said predetermined cards of said file are brought into printing relationship with said web during passage through said printing station.

2. A machine for sequentially printing data carried by cards selected from a file of cards including said selected cards which comprises, a hopper for holding said file of data-bearing cards, the data carried on a face of each of said cards being transferable to the face of a print-receiving web, a printing station, comprising a bed roll, a pair of spaced rollers above said bed roll in pressure contact with said bed roll adjacent its ends, means for moving the cards of said file between said bed roll and said rollers in seriatim, a drum positioned above said bed roll between said rollers around which a print-receiving web is adapted to pass, means for urging said drum into printing pressure contact with said bed roll when predetermined cards of said file pass through the printing station, means for moving said print-receiving web upon said drum to present a fresh surface in response to the passage of said predetermined cards through the printing station, means for

maintaining said drum in upraised position away from said bed roll when all other cards from said file pass through said printing station, whereby only said predetermined cards of said file are brought into printing relationship with said print-receiving web during passage through said printing station, and means for rotating said drum when said drum is in printing relationship with said bed roll.

3. In a machine for selectively printing data carried by predetermined cards of a card file in sequence upon a web which comprises, a bed roll, a pair of rollers in pressure contact with said roll adjacent its ends, means for passing all cards of said file in seriatim between said rollers and said bed roll, a drum positioned between said rollers around which said web passes, means for maintaining said drum upraised away from said roll when predetermined non-selected cards pass between said rollers and the bed roll, means for urging said drum into pressure contact with said bed roll when predetermined selected cards pass between said rollers and the bed roll to transfer data from said selected cards to said web upon the drum, and means for moving said web upon said drum after the passage of a predetermined selected card to present a fresh portion of the web surface.

4. In a machine for selectively printing data carried by predetermined cards of a card file in sequence upon a web which comprises, a bed roll, a pair of rollers in pressure contact with said roll adjacent its ends, means for passing all cards of said file in seriatim between said rollers and said bed roll, a drum positioned between said rollers around which said web passes, normally energized electromagnetic means for maintaining said drum in upraised position away from said roll when predetermined non-selected cards pass between said rollers and the bed roll, means for deenergizing said electromagnetic means when a predetermined selected card passes between said rollers and the bed roll, and resilient means for urging said drum into pressure contact with said bed roll when predetermined selected cards pass between said rollers and the bed roll to transfer data from said selected cards to said web upon the drum, and means for moving said web upon said drum after the passage of a predetermined selected card to present a fresh portion of the web surface.

5. In a selective printing device comprising a printing station, printing pressure means at said printing station between which printing elements and a web to be printed pass, normally energized electromagnetic means at said printing station for rendering said printing pressure means inoperative, an electrical circuit including said electromagnetic means, a pusher member for passing printing elements to said printing station, switches carried by said pusher member connected in said electrical circuit, feeler means carried by said pusher member for actuating predetermined switches, said feeler means being responsive to predetermined printing elements carried by said pusher member to actuate predetermined switches to de-energize said electromagnetic means when predetermined printing elements are passed to said printing station.

6. A selective printing device comprising in combination a printing station, printing means at said printing station, normally energized electromagnetic means for rendering said printing means inoperative, means for passing elements to be printed from to said printing station, means for passing a web to be printed upon to said printing station, electric switches carried by said element-passing means, feelers upon said element-passing means for actuating said switches, predetermined elements passed to said printing station being provided with apertures registerable with predetermined feelers to actuate predetermined switches, an electrical circuit including said electromagnetic means and said switches whereby said actuated switches de-energize said electromagnetic means to render said printing means operative to print from said elements upon said web.

7. A selective printing device comprising in combination a printing station, printing means at said printing station, normally energized electromagnetic means for rendering said printing means inoperative, a pusher for passing cards to be printed from to said printing station, means for passing a web to be printed upon to said printing station, an electric circuit including said electromagnetic means, preselecting switches connected in said electrical circuit actuatable for preselecting predetermined cards to be printed from, selector switches carried by said pusher, said selector switches being connected in said electrical circuit, means carried by said pusher responsive to apertures in said card carried by said pusher to actuate predetermined selector switches correlated to said actuated preselecting switches to de-energize the electromagnetic means and initiate the printing operation.

8. A selective printing device comprising in combination a printing station, printing means at said printing station, normally energized electromagnetic means for rendering said printing means inoperative, a pusher for passing cards to be printed from to said printing station, means for passing a web to be printed upon to said printing station, an electric circuit including said electromagnetic means, preselecting switches connected in said electrical circuit actuatable for preselecting predetermined cards to be printed from, selector switches carried by said pusher, said selector switches being connected in said electrical circuit, feelers carried by said pusher responsive to apertures in a card carried by said pusher during passage of the card to the printing station to actuate predetermined selector switches correlated to said actuated preselecting switches to de-energize the electromagnetic means and initiate the printing operation when said card is delivered to the printing station.

9. A selective printing device comprising in combination a printing station, printing means at said printing station, normally energized electromagnetic means for rendering said printing means inoperative, a pusher for passing cards to be printed from to said printing station, means for passing a web to be printed upon to said printing station, an electric circuit including said electromagnetic means, preselecting switches connected in said electrical circuit actuatable for preselecting predetermined cards to be printed from, selector switches carried by said pusher, said selector switches being connected in said electrical circuit, feelers carried by said pusher responsive to apertures in a card carried by said pusher during passage of the card to the printing station to actuate predetermined selector switches correlated to said actuated preselecting switches to de-energize the electromagnetic means and initiate the printing operation when said card is delivered to the printing station, and

means for moving said web through said printing station during said printing operation.

10. A selective printing device comprising, a printing station, printing means at said printing station, means for passing a web to be printed upon through said printing station, means for passing cards to be printed from in seriatim through said printing station in printing relationship to said web, electromagnetic means for rendering said printing means inoperative, an electrical circuit including said electromagnetic means, and means for de-energizing said electromagnetic means to actuate said printing means, said de-energizing means including selector switches carried by said card-passing means, and cooperative means carried by said card-passing means for actuating predetermined selector switches to de-energize said electromagnetic means.

11. A selective printing device comprising in combination a printing station, said printing station comprising a drum, means for moving said drum into and away from printing position, a pusher for passing an element to be printed from to said printing station, means carried by said pusher for selectively controlling the movement of said drum into and away from printing position in response to a predetermined element passed to the printing station, a print-securing web trained around said drum, a shaft upon which said drum is loosely mounted, means for continuously rotating said shaft, a clutch for engaging said drum and said shaft, and means for actuating said clutch to engage said shaft and drum when said drum is moved to printing position.

12. The device described in claim 11 wherein the element to be printed from carries data inscribed in a moisture transferable ink, means for moistening said web with a solvent for said ink prior to its passage to the printing station.

13. The device as described in claim 12 with means for charging the web moistening means with moisture simultaneously with the actuation of the printing means.

14. A machine for sequentially printing data carried by cards selected from a file of cards including said selected cards which comprises, a hopper for holding said file of data-bearing cards the data of which may be transferred to the face of a print-receiving sheet, a printing station, means for moving all the cards of said file in seriatim continuously to and through said printing station, means for disposing said print-receiving sheet at said printing station adjacent to the passage of cards therethrough, controllable pressure means at said printing station for pressing predetermined selected cards into contact with said print-receiving sheet, said card moving means comprising a pusher member movable toward the printing station, means carried by said pusher member for selecting predetermined cards during movement of said card pushing means and said cards toward said printing station, means actuated by said selecting means for operating said pressure means when said selected cards pass through said printing station to print the data from said selected cards upon said print-receiving sheet, and means for moving said print-receiving sheet after each printing operation.

15. A machine for sequentially printing data carried by cards selected from a file of cards including said selected cards which comprises, a hopper for holding said file of data-bearing cards the data of which may be transferred to the face of a web, a printing station, means for moving all the cards of said file in seriatim continuously to and through said printing station, means for disposing said web at said printing station adjacent to the passage of cards therethrough, controllable pressure means at said printing station for pressing predetermined selected cards into contact with said web, means for operating said pressing means, said card moving means comprising a pusher member movable toward said printing station, means carried by said pusher member for selecting predetermined cards during movement of the pusher member, the selecting means and the cards toward said printing station, means actuated by said selecting means and carried by said pusher member for presetting said pressure setting means when said predetermined selected cards pass through said printing station to print the data from said selected cards upon said web, and means for moving said web through said printing station only when selected cards pass therethrough.

16. A machine for sequentially printing data carried by predetermined cards selected from a file of cards including said selected cards which comprises, a hopper for holding said file of data-bearing cards, the data carried on a face of each of said cards being transferable to the face of a web, a printing station, means for moving all the cards of said file in seriatim continuously to and through said printing station, means for moving a web through said printing station adjacent to the passage of cards therethrough in timed relationship with the movement of said predetermined selected cards through said station, controllable pressure means at said printing station for pressing said predetermined selected cards into contact with said moving web, said card moving means comprising a pusher member movable toward said printing station, a feeler carried by said pusher member and movable with said pusher member toward said station for selecting predetermined cards during movement of said card moving means, means carried by said pusher member and actuated by said feeler in selecting predetermined cards for actuating said pressure means when predetermined cards pass through said printing station to transfer the data from said selected cards upon said web, means for moving said moistened web through said printing station only when selected cards pass therethrough.

17. A machine for sequentially printing data carried by cards selected from a file of cards including said selected cards which comprises, a hopper for holding said file of data-bearing cards, the data carried on a face of each of said cards being transferable to the face of a print-receiving sheet, a printing station, means for moving all the cards of said file in seriatim continuously to and through said printing station, said card moving means comprising a pusher member movable toward said printing station, means for disposing said print-receiving sheet at said printing station adjacent to the passage of cards therethrough, electrically controlled pressure means at said printing station for pressing predetermined selected cards into contact with said print-receiving sheet, an electrical circuit associated with said electric control, switch means carried by said pusher member and movable therewith toward said station for selecting predetermined cards during movement upon said pusher member and selector means toward said station, means con-

necting said card selector means and said switches for operating said switches during the card selecting operation for actuating said pressure means when said predetermined cards pass through said printing station to print data from said selected cards upon said print-receiving sheet.

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