

Sept. 29, 1953

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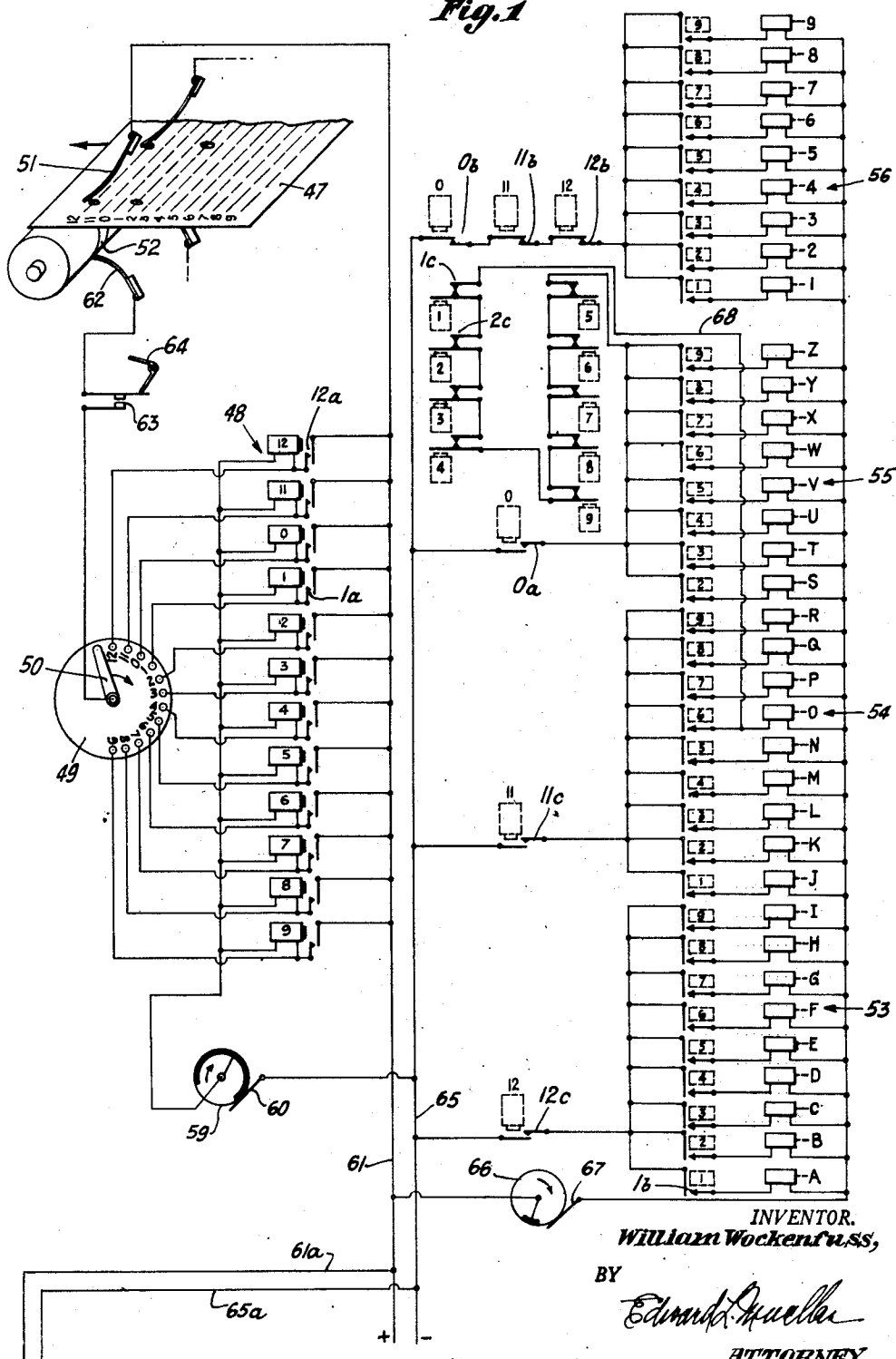
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WIRE CHARACTER FORMING PRINTING MACHINE

Filed June 26, 1948

6 Sheets-Sheet 1

Fig. 1



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Fig. 2

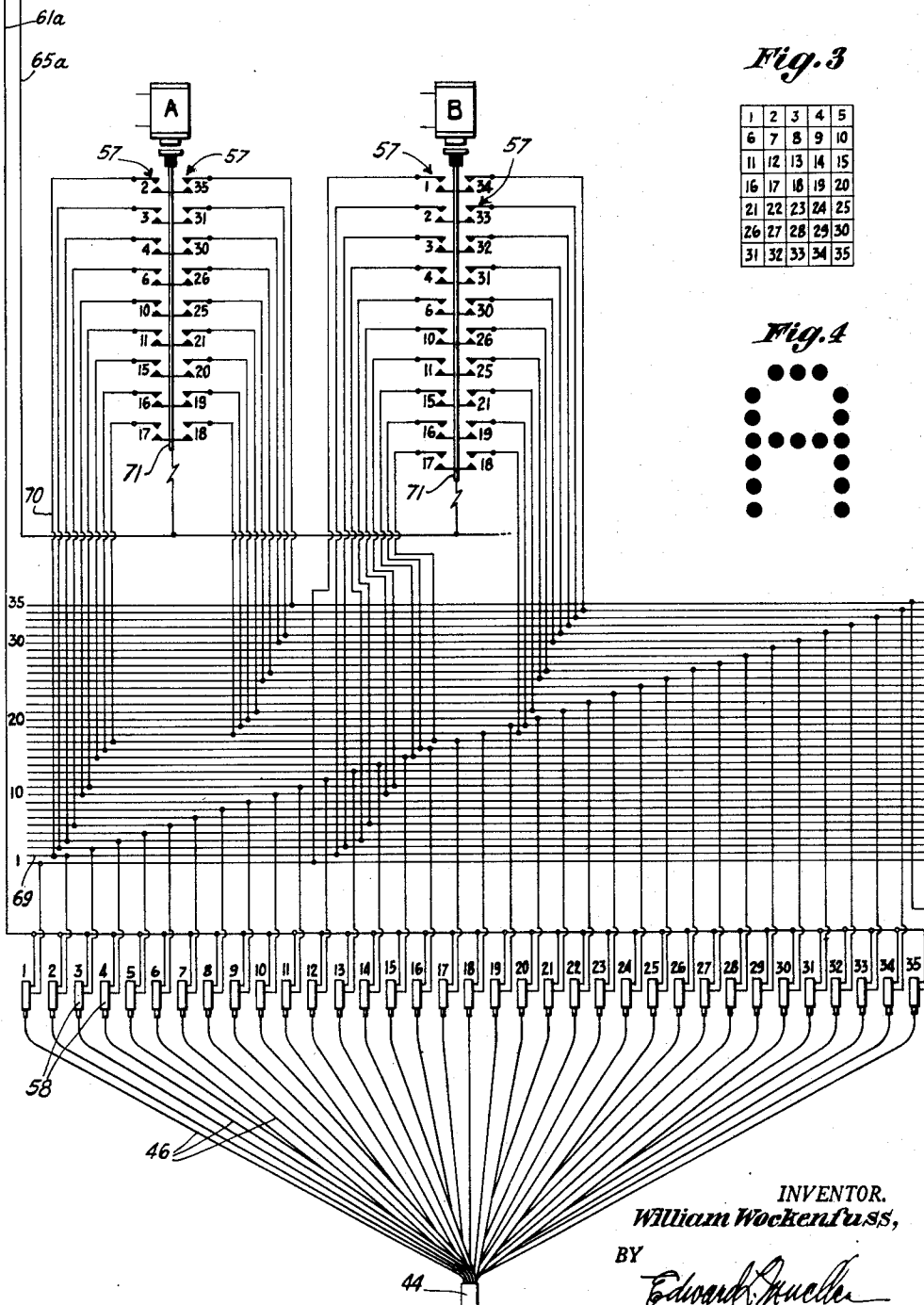
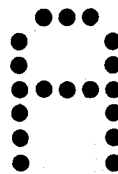


Fig. 3

1	2	3	4	5
6	7	8	9	10
11	12	13	14	15
16	17	18	19	20
21	22	23	24	25
26	27	28	29	30
31	32	33	34	35

Fig. 4



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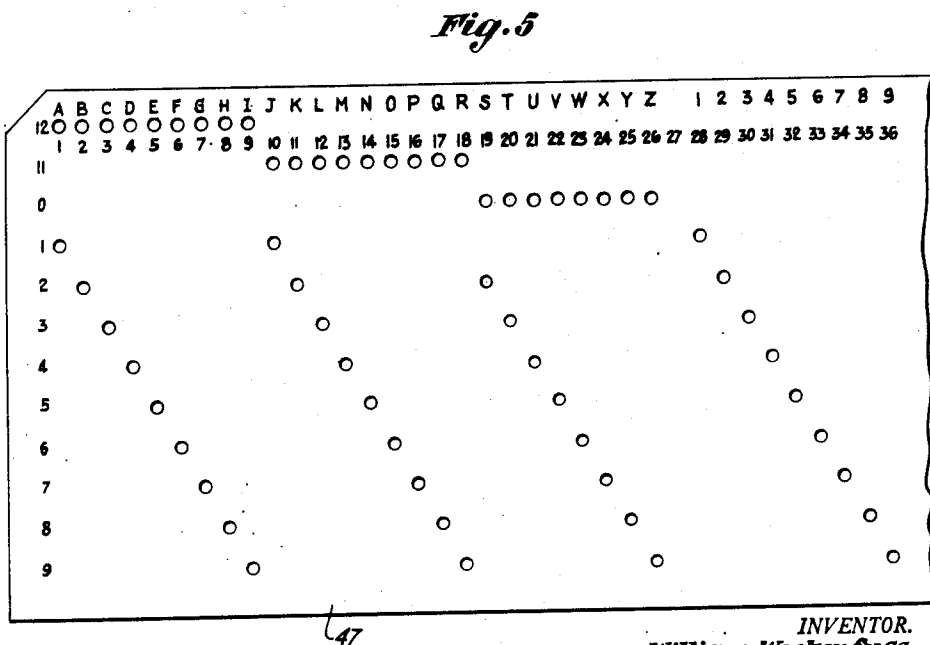
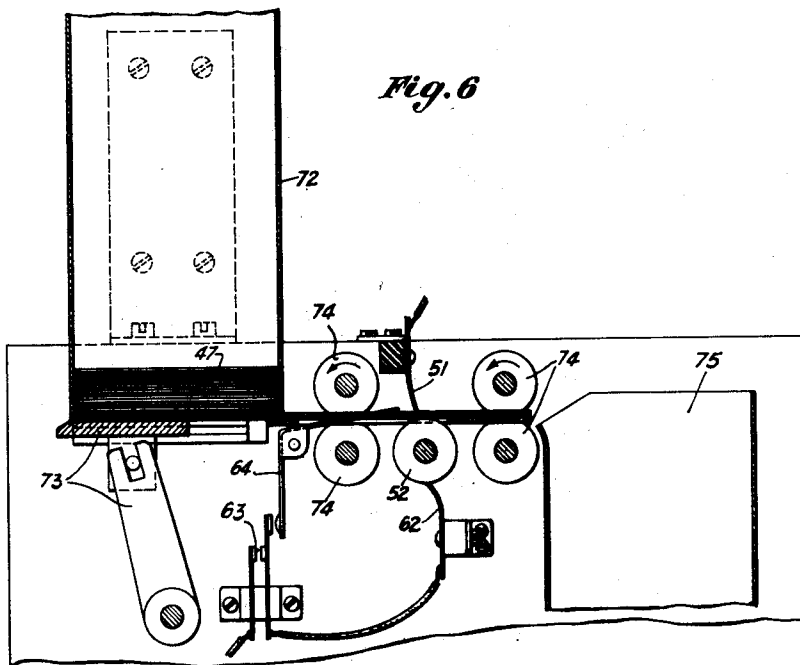
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WIRE CHARACTER FORMING PRINTING MACHINE

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6 Sheets-Sheet 3



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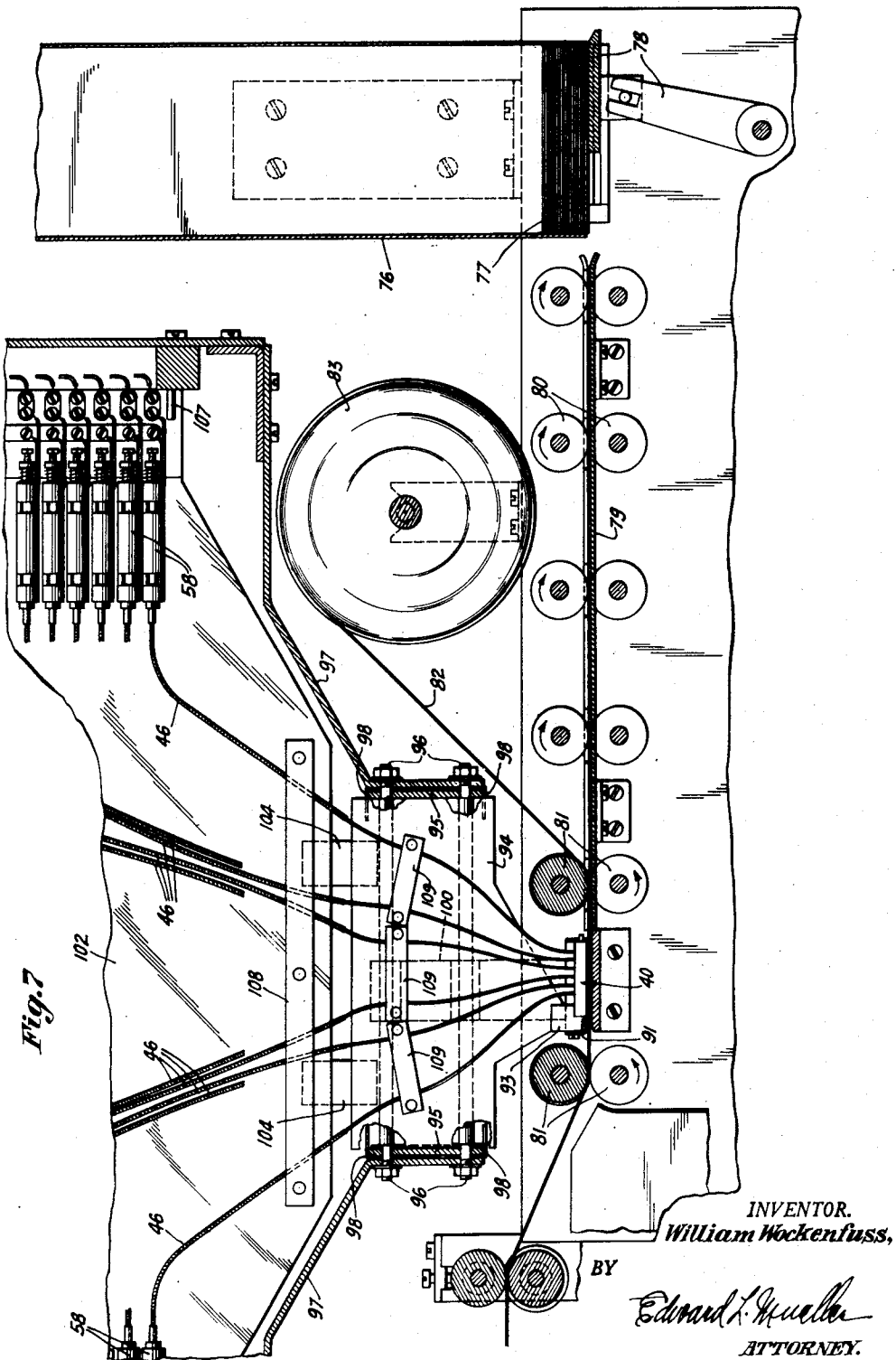
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WIRE CHARACTER FORMING PRINTING MACHINE

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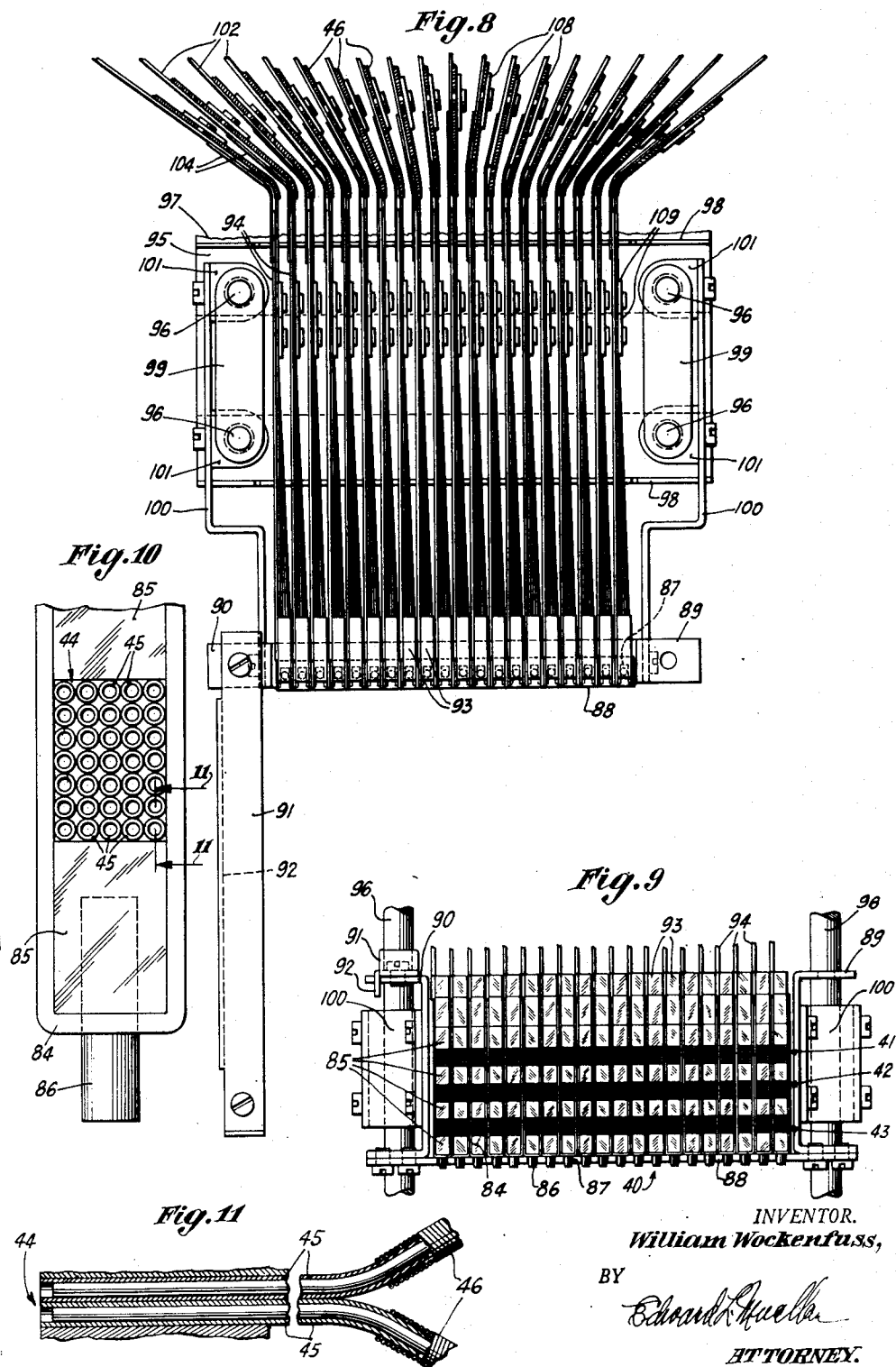
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WIRE CHARACTER FORMING PRINTING MACHINE

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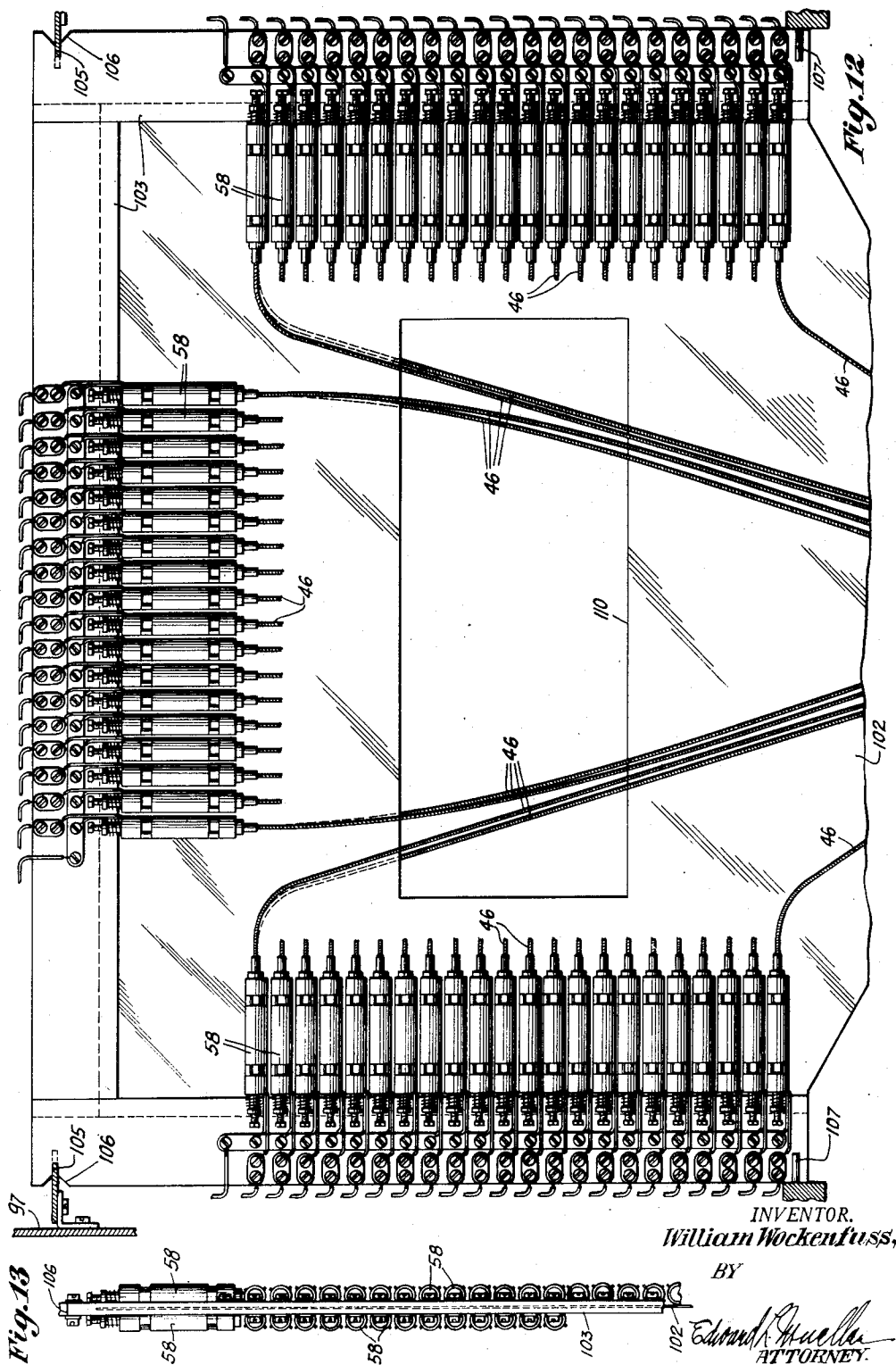
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WIRE CHARACTER FORMING PRINTING MACHINE

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6 Sheets-Sheet 6



UNITED STATES PATENT OFFICE

2,653,534

WIRE CHARACTER FORMING PRINTING MACHINE

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chine Company, a corporation of Michigan

Application June 26, 1948, Serial No. 35,307

6 Claims. (Cl. 101—93)

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This invention relates to improvements in printing machines and has particular reference to a machine wherein a plurality of printing heads are each utilized for printing different characters.

Printing units are known wherein a multiplicity of printing elements in the form of wires are selectively operated by various means to constitute different characters. Also, it has been common practice to control the setting of type bars of statistical record card machines to print alphabetic characters, represented in a card by a combinational code consisting of zonal and numerical designations usually in the form of perforations located at index point positions in said card, by successively sensing said designations at two separated card analyzing stations. Further, in machines known as alphabetic interpreters, wherein cards are punched with numerical designations and also with an alphabetic combinational code and wherein said designations in both instances are interpreted and the characters represented thereby are printed on said cards, it has been proposed to employ a single card analyzing station past which each card is fed at different speeds, one for the analysis of only the numerical designations and the other for the interpretation of the combinational code.

In accordance with one feature of the present invention, the control of a unit utilized to print both numerical and alphabetic characters is accomplished by means of a single card analyzing station past which each card is fed at a uniform rate of speed and at which the numerical and alphabetic designations are successively analyzed to control said unit.

Another feature of the invention resides in forming a print unit of a plurality of printing elements selectable in various combinations each capable of printing a different character, and in controlling the operation of a selected combination of said elements from a single record analyzing station at which zonal and numerical designations identifying alphabetic characters are successively sensed.

According to still another feature, a plurality of print units, each consisting of a multiplicity of selectively operable printing elements, are arranged in groups to effect simultaneous multiline printing on a single impression-receiving surface each time the zonal and numerical designations of a combinational code in a record are successively sensed at a single analyzing station.

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The above and other features will appear more clearly from the following detailed description when taken in connection with the accompanying drawings; but it is to be expressly understood that said drawings are employed merely to facilitate the description of the invention as a whole and not to define the limits thereof, reference being had to the appended claims for this purpose.

In the drawings:

Figs. 1 and 2, when combined, illustrate, diagrammatically, the circuits involved in the control of one of the printing heads of the machine;

Fig. 3 is a diagrammatic view of one of the printing heads;

Fig. 4 is a view showing the type of character adapted to be printed by said head;

Fig. 5 is a view of a record card which may be employed in the operation of the machine and showing thereon the code for recording alphabetical and numerical characters;

Fig. 6 is a fragmentary vertical longitudinal section of a portion of the machine illustrating a card feeding and analyzing mechanism which may be employed;

Fig. 7 is a similar view of a mechanism for feeding envelopes, cards, or the like to the printing mechanism which operates to print analyzed data on the impression receiving surface;

Fig. 8 is a partial elevation of the printing section of the machine and associated parts;

Fig. 9 is a bottom plan view of the printing section;

Fig. 10 is an enlarged fragmentary elevation of one of the printing units employed in said section and showing one of the printing heads;

Fig. 11 is a section on the line 11—11 of Fig. 10;

Fig. 12 is an elevation of one of the panels upon which are mounted the operating members for a group of printing heads; and

Fig. 13 is a fragmentary edge elevation of said panel and the operating members thereon.

The invention is illustrated in its application to an addressing machine wherein record cards punched in accordance with any predetermined code may be utilized to control in a single operation the simultaneous printing of a plurality of lines of complete characters constituting an address, but it will be understood that a continuous tape or other suitable control means may be employed and that data other than addresses may be printed without departing from the spirit or scope of the invention.

In carrying out the fundamental principle of

simultaneous multi-line printing, the invention provides a print section generally indicated at 40 (Figs. 7 and 9) which comprises a multiplicity of banks or rows of printing devices or heads with each bank being representative of a line of printing, there being three of such banks 41, 42 and 43 shown for purposes of illustration. The number of these banks and of the heads 44 in each of them may be varied at will since this merely involves a duplication of parts. The detailed construction and assembly of the printing heads and associated parts will be fully described hereinafter but, for purposes of the description to immediately follow, it is desired to explain that each of these heads 44 comprises, as diagrammatically illustrated in Fig. 3 and structurally shown in Figs. 10 and 11, thirty-five tubes 45 arranged in a rectangle and through each of which extends a printing element 46 in the form of a Bowden wire adapted to be projected from its normal position of Fig. 11 to form, by such projection, one portion of a character such as a numeral or a letter of the alphabet so that when a plurality of wires in the various heads 44 are selected and then simultaneously operated, in a manner to presently appear, they will combine to form the desired complete characters. Thus, as diagrammatically illustrated in Figs. 2, 3 and 4, the selection of wires 46 indicated in Fig. 3 by the numerals 2, 3, 4, 5, 10, 11, 15, 16, 17, 18, 19, 20, 21, 25, 26, 30, 31 and 35 will form the letter A of Fig. 4 and, as indicated in Fig. 2, the letter B can be formed in any one of the various heads 44 by the selection of the wires 46 in said head designated by the numerals applied to the various contacts of the relay marked B. In the same manner, the remaining letters of the alphabet and the numerals 1 to 9 may be formed in any of the printing heads by the proper selection and operation of the wires 45 which, combined, constitute the desired characters to be printed thereby.

The circuit of Figs. 1 and 2 is individual to one printing head 44 and, in the specific application herein illustrated, to one column of a card 47 which is of a type well known in the tabulating art. Fig. 5 shows one of these cards punched with an alphabetical and numerical code which may be employed for recording an address or other data, and wherein twelve digital positions or index points are provided for each column corresponding to the letters of the alphabet, with the zoning points 12, 11 and 0 being first to be sensed and being assigned, respectively, to the groups of letters A to I, J to R and S to Z, and with each letter having further assigned thereto in its column one of the other digital index points 1 to 9 so that two points are utilized for the interpretation of each letter of the alphabet, as distinguished from the single index point for each of the numerals 1 to 9. In this code, and throughout the circuit, the character formation of the letter and the digit 0 are the same.

In said circuit, there is provided, for each column of the card 47 to be analyzed, a group of decoding and storing relays generally indicated at 48 and controlled by a distributor 49 having a continuously rotating wiper 50, operating in synchronism with similar wipers in all the circuits, to successively engage with individual terminals of the relays of said group to energize said relays when the analyzing brush 51 individual to a card column makes contact with a conducting segment 52 of a common conducting roller through perforations in said column as the card 47 passes be-

neath the brush. Operatively associated with the group of relays 48 is a set of thirty-five selectable character-identifying relays arranged in four groups 53, 54, 55 and 56 representing the letters of the alphabet and the digits 1 to 9. As shown in Fig. 2, each relay of the various groups is provided with a series of contacts 57 which combine, when the relay is energized immediately following the complete analysis of the card 47, to establish circuits for the energization of certain of the thirty-five solenoids of the group 53 all of which are associated with the single printing head 44, and those that are energized being individual to the correspondingly numbered contacts 57 of said relay. Each solenoid 58 controls one of the printing elements or wires 46 to impel the same outwardly of the tube 45 in which it is mounted and this operation is so rapid as to be simultaneous, thus enabling the printing surface to be moved uninterruptedly past the printing section 40 while the character formed by the energized group of solenoids and their wires is being printed or otherwise impressed upon said surface. The circuits individual to all the remaining heads operate in the same general manner as described so that all the selected groups of solenoids in the various circuits are simultaneously energized at the conclusion of the card analysis and the complete record punched in said card will be simultaneously printed by the three banks 41, 42 and 43 of the printing section 40.

With the card 47 in the position of Fig. 1 and traveling in the direction of the arrow, the brush 51 over the first column is about to enter the #12 zoning hole therein and the conducting segment of the control commutator 59 for the relays 48 has engaged its wiper 60 so that when said brush 51 makes contact with the conducting element 52 through the perforation in the card, an energizing circuit for the zoning relay 12 of group 48 is established from the line conductor 61 through the brush 51 and segment 52, the brush 62, contacts 63 closed by the card lever 64 when a card is in sensing position, wiper 50 then engaged with terminal #12 of the distributor 49, winding of said relay, and thence through the commutator 59 to the other line conductor 65. The commutator segments for all the other circuits associated with the remaining columns of the card operate in synchronism with the one illustrated. Relay 12 of group 48 energizes and locks up through its front contact 12a for the duration of the engagement of the wiper 50 with the conducting segment of the commutator 59, and energization of said relay also opens its back contact 12b and closes its front contact 12c. Opening of the back contact 12b disconnects the line conductor 65 from the group of character relays 56, and closure of the front contact 12c connects the relay group 53 to said conductor, thereby predetermining the selection and energization of one of the relays in the latter group. The first column brush 51 next encounters the #1 hole in the card 47 which, together with the #12 hole in the code illustrated, identifies the letter A. When said #1 hole is sensed, relay 1 of group 48 energizes in a circuit extending through wiper 50 now engaged with terminal #1 of the distributor, and is locked up through its front contact 1a. Closure of the front contact 1b located adjacent the A relay 53 prepares a circuit for the energization of said relay when the conducting segment of commutator 66, which segment is similarly positioned on the commutators in all the circuits, engages its wiper 67 which occurs at the conclusion of the complete analysis of the card 47 and just before the con-

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ducting segment of commutator 59 disengages from its wiper 60. During the next card sensing and printing cycle in which the brushes of all the commutators 66 are on the non-conducting segments thereof, the surface being printed will be moved a distance one line space in excess of the combined height of the spaced rows of print heads 41, 42 and 43 so that at the next printing operation in said cycle the three lines of printing will be properly spaced from the previously printed lines. The circuit for energizing the relay 53 for forming the letter B is prepared in the same manner by the brush 51, associated with the second card column, successively sensing the #12 and #2 holes in the card, and all the remaining letters of the alphabet are similarly prepared for printing by the individual relays of groups 53, 54 and 55 under control of the different zoning relays 12, 11 and 0 in combination with the other relays of group 48. It will be noted that with respect to group 55, the relay 1 of group 48 has no front contact similar to the contact 1b since there is no 0, 1 combination in the code employed, and it will be further seen regarding said group that the front contact 0a of the zoning relay 0 is in series with back contacts 1c, 2c, etc. of the respective relays 1 to 9 of group 48. Said back contacts are provided for the alternate control of the relay in group 54 representing the character 0 either as a letter or a digit. It will be observed that when a brush 51 senses a 0 perforation in the card, the front contact 0a of the relay 0 of group 48 will be closed and this would normally result in the selection of the relay group 55 which controls the printing of letters S to Z, and such result would obtain if another hole were punched in the card column being sensed. However if the 0 perforation is the only one in said column, then none of the series of back contacts 1c, 2c, etc. of the various relays 1 to 9 of group 48 would be open, and since the front contact 11c of relay 11 serving the group 54 is not closed at this time, an energizing circuit is prepared for the relay of group 54 representing the character 0. This circuit, which is closed by commutator 66, extends from conductor 61 through said commutator, winding of said 0 relay in group 54, conductor 68, the back contacts 1c, 2c, etc. of all relays 1 to 9, and thence through the front contact 0a to the line conductor 65. Thus, the analysis of the single 0 hole in the card column will result in the printing of the digit 0. From the foregoing, it will now be obvious that if only an index point representing one of the digits 1 to 9 is punched in a column, no zoning relay will be energized in group 48 and therefore all the back contacts 12b, 11b and 0b of said relay will remain closed to thus prepare a circuit for one of the relays in group 56 depending upon which one of the relays 1 to 9 in group 48 is energized by the sensing of a corresponding hole in the card 47.

Referring now to Fig. 2, it will be apparent that when the wiper 67 of commutator 66 of each of the control circuits engages its conducting segment, all of the individual circuits which have been prepared for the relays in groups 53 to 56 of said various control circuits will be closed simultaneously and said relays will thereupon be energized to establish energizing circuits for the respective groups of solenoids assigned to said relays. Immediately after such energization, the wiper 68 of the commutator 59 disengages from its conducting segment to open the locking circuits for the relay group 48 of each control circuit and when the wipers 67 of the commutators 66

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in the various control circuits disengage from their conducting segments the energizing circuits of the relay groups 53 to 56 in each circuit are also opened to release said relays in preparation for the next card analysis. For example, when the relay which controls the printing of the letter A is energized in the circuit described therefor, its various numbered contacts are closed and circuits are established for energizing solenoids in the group 58 which are correspondingly numbered. A description of one of these circuits will be sufficient for an understanding of the manner in which all of the solenoids are energized. Thus, upon energization of said relay, a circuit is established for the #2 solenoid extending from the line conductor 61a connected to the same source of current as the conductor 61, through the winding of the #2 solenoid, the common bus 69, the conductor 70, the #2 contact of said relay, the common conductor 71, and thence over the line conductor 65a. Through the other contacts 57 of the relay, the remaining solenoids of the group controlled thereby are similarly energized over obvious circuits to effect the simultaneous operation of the printing elements or wires 46 connected to said solenoids so that said wires will combine to print the letter A on a suitable surface. All of the remaining alphabetical and numerical relays in the various groups 53 to 56 associated with each of the printing heads are energized simultaneously with the relay just described by the pulse which is transmitted through the circuit by the commutator 66, thus resulting in the simultaneous operation of all the selected printing heads in the three banks 41, 42 and 43.

From the foregoing description, it will now be obvious that during a single cycle of operation of the machine, which begins with the feed of one card under the brushes 51 and concludes when the conducting segments of the commutators 66 of the various print head circuits disengage from their respective brushes 67, the card is decoded and the information read therefrom is caused to be printed at the various print heads 44 before the start of the analysis of the next succeeding card.

As an example of a structural arrangement by which the invention may be carried into effect, reference is had to Figs. 6 to 13. When employing punched cards 47 in the transmission of data, the same may be stacked in a feed magazine 72 (Fig. 6) from which they are fed at a uniform rate of speed by a conventional reciprocating picker mechanism 73 in a manner well known in the tabulating art. As the cards successively leave the magazine, they are fed between the sets of feed rollers 74 which are continuously driven at a constant speed by any suitable means so that the cards will be analyzed in flight by the sensing brushes 51 each individual to a card column, and from said feed roller 74 the cards are discharged into a pocket 75.

Any impression receiving surface, such as an envelope, card, sheet or the like is adapted to be fed to the printing section 40 in timed relation to the sensing of the cards 47 so that said surface will be in printing position at the instant that the commutator 66 becomes effective to instantaneously energize the various selected groups of solenoids individual to the different printing heads in the banks 41, 42 and 43. As shown in Fig. 7, a magazine 76 may receive a stack of envelopes 77 or the like which are fed therefrom by the picker mechanism 73 similar to the mechanism 73 and operable in synchronism therewith by any known means (not shown). The envelopes are

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fed from the magazine 76 to the guide 79, then along the latter by constantly driven pairs of feed rollers 80, and thence between two additional pairs of rollers 81 on opposite sides of the printing section 40 and beneath an inking ribbon 82 guided by the upper rollers of the latter pairs as it is fed from the reel 83 by any suitable mechanism. As the envelope reaches its printing position beneath the banks of printing heads, the selected solenoids are simultaneously operated to cause their Bowden wires 46 to impress, through the ribbon 82, the various preselected characters in each bank and thereby simultaneously print a plurality of lines equal to the number of banks in the printing section.

Figs. 8 to 11 illustrate the construction and assembly of the printing heads which are divided into groups of three with each group mounted in an elongated supporting unit 84 and uniformly spaced therein by blocks 85 so as to constitute the three banks or rows 41 to 43 when the units are individually positioned in their supporting frame. Each unit is provided with a pin 86 at its closed end adapted to engage in a notch 87 in the end plate 88 of said supporting frame. Secured to the extremities of said plate are the brackets 89 and 90 and to the latter there is pivoted the lock bar 91 shown open in Fig. 8 and having a flange 92 adapted to engage the shouldered filler blocks 93 (Figs. 7 and 9) disposed in the units 84, when said bar is swung closed and locked to the bracket 89, thereby to support and retain the units 84 and their printing heads in proper position. Each of the blocks 93 has welded or otherwise affixed thereto a mounting plate 94 (Figs. 7 and 8) and this series of plates is supported in position by a frame consisting of two end members or plates 95 connected together by tie rods 96 extending through said members and the lower end of the main housing 97. Upper and lower combs 98 are fastened to the members 95 and receive the ends of the plates 94 to maintain the same in spaced relation, and the tie rods 96 are joined by braces 99. The frame members 95 are supported above the print section 40 by angle arms 100 secured at their lower ends to the brackets 89 and 90 and provided with lugs 101 through which the tie rods 96 extend.

Associated with each of the mounting plates 94 is a panel 102 (Figs. 8 and 12) upon opposite sides of the insulated frame 103 of which are supported the solenoids 58 for three of the printing heads 44. Each panel is connected to its mounting plate by straps 104 made of resilient metal so as to permit the panels to be adjusted and spaced in upwardly diverging relation, as shown in Fig. 8. Flanges 105 (Fig. 12) carried by the main housing 97 engage in notches 106 in the upper portions of the side edges of the panel frames 103, and pins 107 also carried by said housing adjacent the lower portions of the panels form stops which maintain said panels in their diverging relationship against the action of the resilient straps 104.

Since twenty mounting plates 94 and sixty printing heads 44 are shown, each panel 102 carried by a plate 94 has mounted thereon three sets of solenoids 58, one for each of the heads 44 disposed within one of the units 84. Thus, as illustrated in Figs. 7, 12 and 13, two groups of twenty-two and one group of eighteen solenoids are mounted on one face of the side and top sections of the insulated frame 103 of the panel, and on the opposite face of the side sections thereof and associated with the two mentioned groups are two other groups of thirteen solenoids

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each, while on the opposed face of said top section there would be a group of seventeen solenoids to pair with the other group of eighteen on said top section. Therefore, for the three printing heads served by each panel, there are three groups each consisting of thirty-five solenoids. The various Bowden wires 46 leading from the solenoids on the front face of the panel are extended downwardly beneath the retaining straps 108 and 109 secured to the panel 102 and associated plate 94, respectively, and the wires from the solenoids on the rear face of the panel are extended through an aperture 110 in said panel where they join the wires leading from the front solenoids, and then all of the wires are connected to their respective printing heads.

What is claimed is:

1. In a printing machine under control of records wherein alphabetic characters are each identified by means of a combinational code consisting of two selectively disposed designations one of which is zonal and the other numerical, said machine comprising a single analyzing station having means thereat for successively sensing both the zonal and numerical designations of said code, means to feed records seriatim past said sensing means, a print unit including a plurality of printing elements each selectively operable in combination with others to form any one of a plurality of complete characters during a single operation of said elements, character-identifying electromagnetic devices each representing a different character and each controlling the operation of a different combination of printing elements, means responsive to the sensing of the zonal and numerical designations of a record at said single analyzing station for selecting the electromagnetic device which identifies the character represented by said sensed designations, means thereupon operable to energize the selected electromagnetic device, and means controlled by the energization thereof for imparting a single operation to the combination of printing elements to print the complete character identified by said selected electromagnetic device.

2. In a printing machine under control of records wherein alphabetic characters are each identified by means of a combinational code consisting of two selectively disposed designations one of which is zonal and the other numerical, said machine comprising a single analyzing station having means thereat for successively sensing both the zonal and numerical designations of said code, means to feed records seriatim past said sensing means, a print unit including a plurality of printing elements each selectively operable in combination with others to form any one of a plurality of complete characters during a single operation of said elements, groups of character-identifying electromagnetic devices each representing a different character and each controlling the operation of a different combination of printing elements, a plurality of decoding relays, one for each zonal and numerical designation, energized by the sensing of designations identifying the alphabetic character to be printed, means controlled by the energization of two of said relays to select a group of said electromagnetic devices and a single device in the selected group, and a plurality of other electromagnetic devices, one for each printing element of the combination identified by a selected first named electromagnetic device, controlled by the latter device for operating the printing elements of said identified combination.

3. In a printing machine under control of records wherein alphabetic characters are each identified by means of a combinational code consisting of two selectively disposed designations one of which is zonal and the other numerical, said machine comprising a single analyzing station having means thereat for successively sensing both the zonal and numerical designations of said code, means to feed records seriatim past said sensing means, a plurality of print heads each comprising a multiplicity of printing elements selectable in various combinations to identify different characters, operating devices for each of said printing elements activated, after selection of a combination thereof, to print the character identified by the selected combination, a plurality of character-identifying electromagnetic devices for each print head arranged in groups with each device assigned to one of the characters to be printed by said head and each having a multiplicity of contacts each individual to one of said operating devices, circuits connecting said contacts with their associated operating devices to activate the latter when said electromagnetic device is energized to close its contacts, means to simultaneously energize selected electromagnetic devices of all said print heads, and a group of decoding relays assigned to each print head and controlled by said card analyzing means for selecting one of the electromagnetic devices of said head for energization, said group including zoning relays each having a contact connecting the same to one of said groups of electromagnetic devices and the remaining relays of said decoding group having a plurality of contacts each connecting an electromagnetic device of one of said groups to said energizing means through one of said zoning relay contacts.

4. In a printing machine under control of records wherein alphabetic characters are each identified by means of a combinational code consisting of two selectively disposed designations one of which is zonal and the other numerical, said machine comprising a single analyzing station having means thereat for successively sensing both the zonal and numerical designations of said code, means to feed records seriatim past said sensing means, a plurality of print heads each comprising a multiplicity of printing elements selectable in various combinations to identify different characters, operating devices for each of said printing elements activated, after selection of a combination thereof, to print the character identified by the selected combination, a plurality of character-identifying electromagnetic devices for each print head arranged in groups with each device assigned to one of the characters to be printed by said head and each having a multiplicity of contacts each individual to one of said operating devices, circuit connections between said contacts and their associated operating devices to activate the latter when said electromagnetic device is energized to close its contacts, means to simultaneously energize selected electromagnetic devices of all said print heads, and a group of decoding relays, one for each index point position of a card, assigned to each print head and controlled by said card analyzing means for selecting one of the electromagnetic devices of said head for energization, said group including zoning relays each having a contact connecting the same to one of said groups of electromagnetic devices, the remaining relays of said decoding group having a plurality of contacts each connecting an electromagnetic device

of one of said groups to said energizing means through one of said zoning relay contacts, said zoning relays having other normally closed contacts in series with the electromagnetic devices of one of the groups thereof, and said remaining relays of the decoding group having normally closed contacts in series with an electromagnetic device of another of said groups.

5. In a printing machine under control of records wherein alphabetic characters are each identified by means of a combinational code consisting of two selectively disposed designations one of which is zonal and the other numerical, said machine comprising a single analyzing station having means thereat for successively sensing both the zonal and numerical designations of said code, means to feed records seriatim past said sensing means at a uniform rate of speed, and means controlled by the sensing of both the zonal and numerical designations in one record at said single analyzing station to print the alphabetic characters identified by said code before the next succeeding record being fed to said station reaches a sensing position thereat, said last named means comprising a plurality of print units arranged to print a plurality of lines of characters on a single impression-receiving surface simultaneously each said unit comprising a plurality of printing elements selectable in various combinations each capable of printing a different one of said characters, means controlled by said record sensing means to select a combination of printing elements in each of said print units, and means thereupon operable to simultaneously actuate the selected printing elements of all of said units to print said plurality of lines.

6. In a printing machine under control of records wherein alphabetic characters are each identified by means of a combinational code consisting of two selectively disposed designations one of which is zonal and the other numerical, said machine comprising a single analyzing station having means thereat for successively sensing both the zonal and numerical designations of said code, means to feed records seriatim past said sensing means at a uniform rate of speed, and means controlled by the sensing of both the zonal and numerical designations in one record at said analyzing station to print the alphabetic characters identified by said code before the next succeeding record being fed to said station reaches a sensing position thereat, said last named means comprising a plurality of print units arranged to print a plurality of lines of characters on a single impression-receiving surface simultaneously each said print unit comprising a plurality of printing elements selectable in various combinations each capable of printing a different one of said characters, an electromagnetic device individual to each of said combinations of printing elements in each print unit, circuits in each print unit connected to the sensing means at the said analyzing station for selectively energizing an electromagnetic device in said unit in response to the sensing of a combinational code at said station, means to then energize the selected electromagnetic devices in all said print units simultaneously, and means controlled by the energization of said electromagnetic devices to simultaneously operate the selected combinations of printing elements in all said print units.

WILLIAM WOCKENFUSS.

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