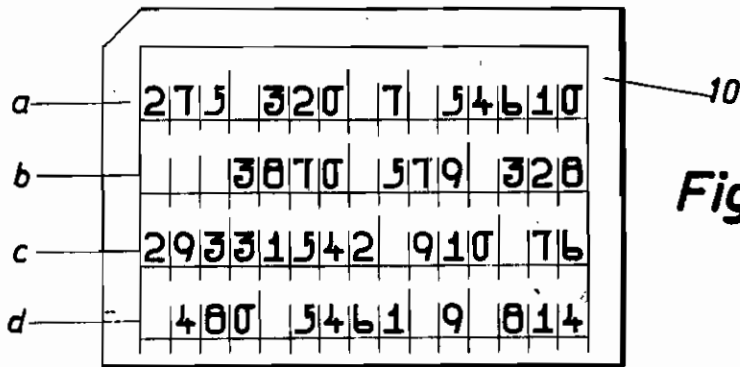
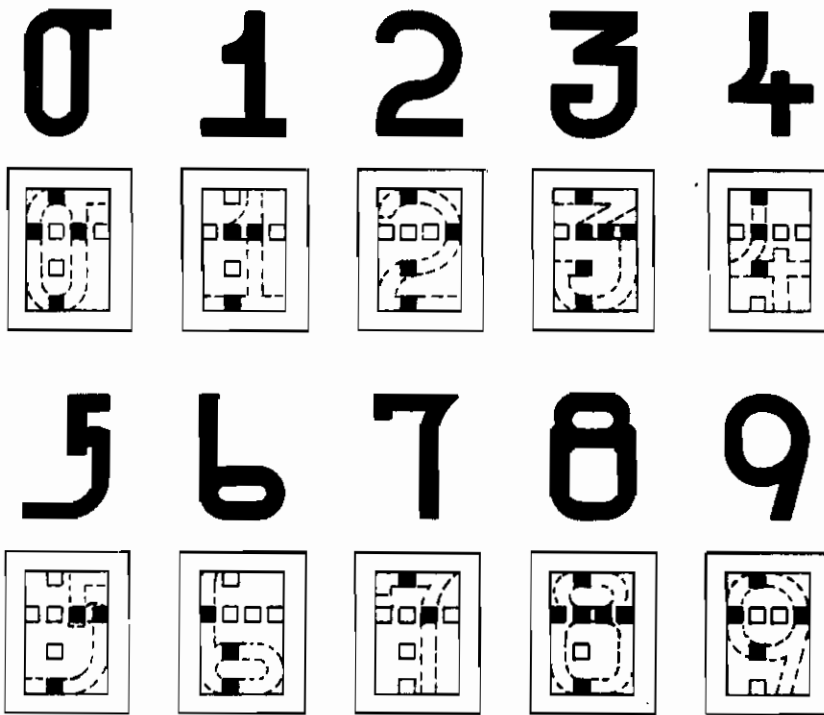


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RECORD CONTROLLED MACHINE  
Filed Sept. 16, 1939

Serial No.  
295,224  
12 Sheets-Sheet 1

*Fig. 1*



*Fig. 2*

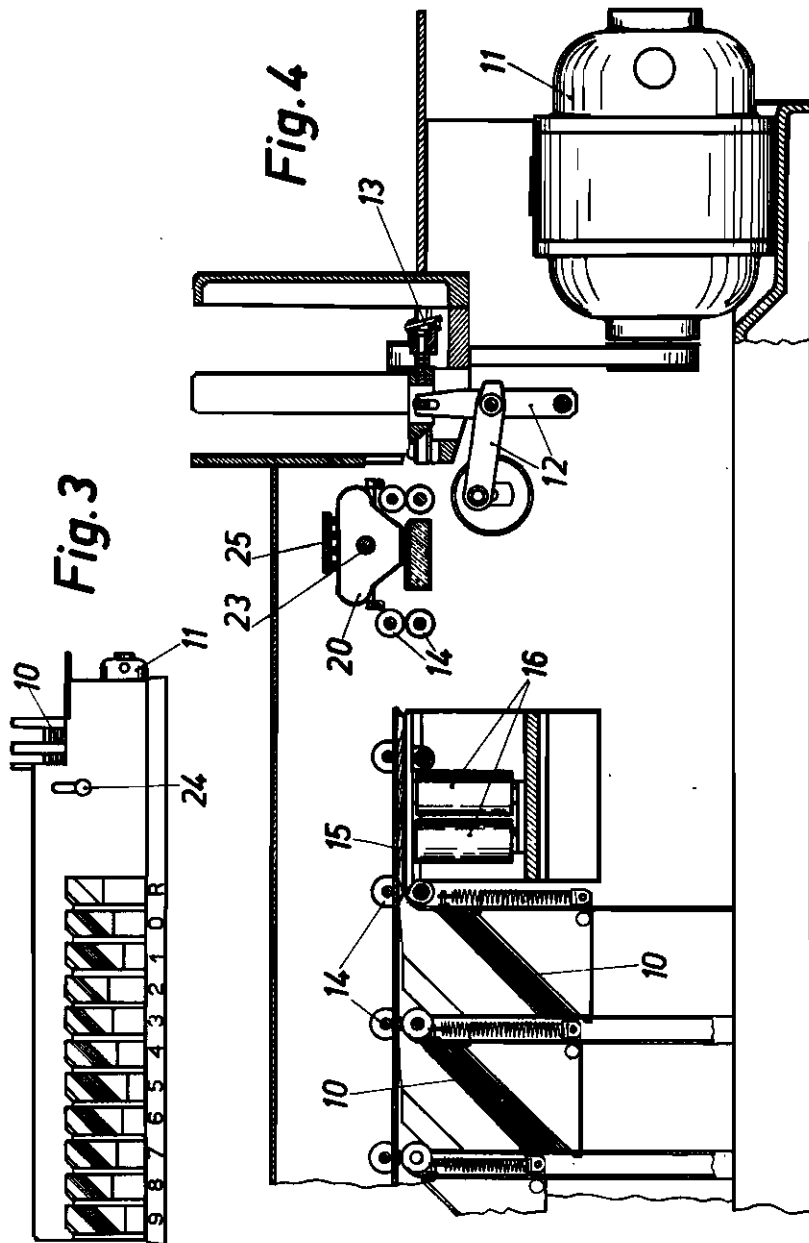
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12 Sheets-Sheet 2



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Serial No.

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12 Sheets-Sheet 3

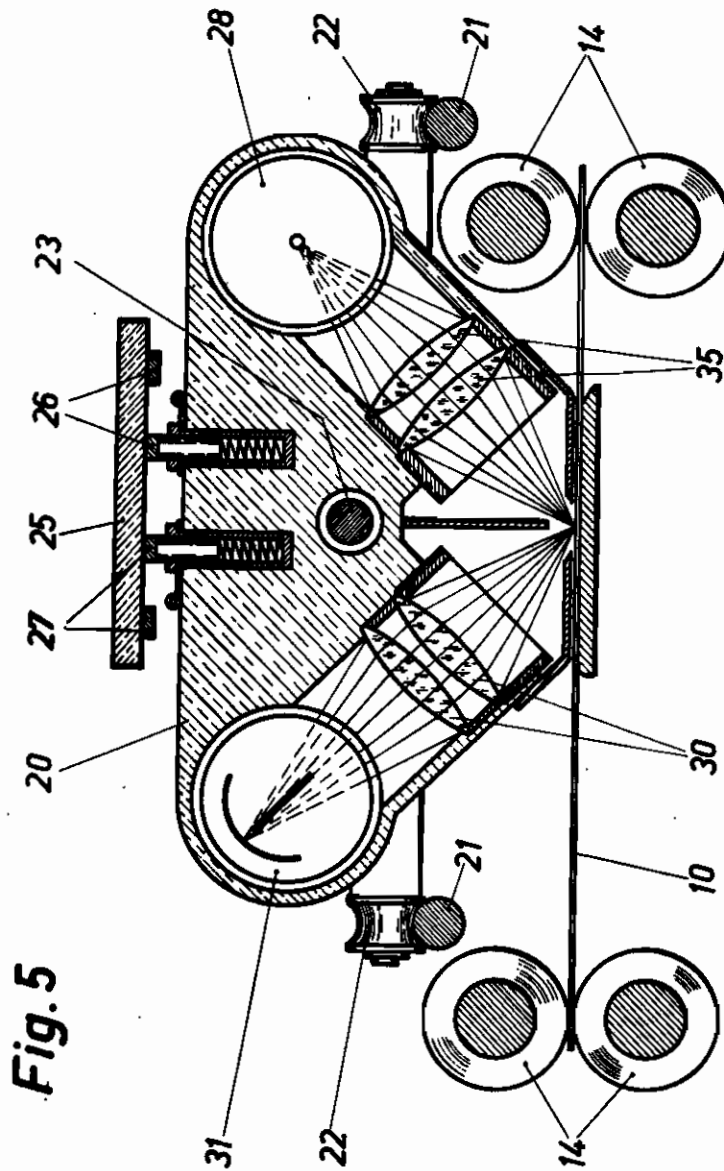


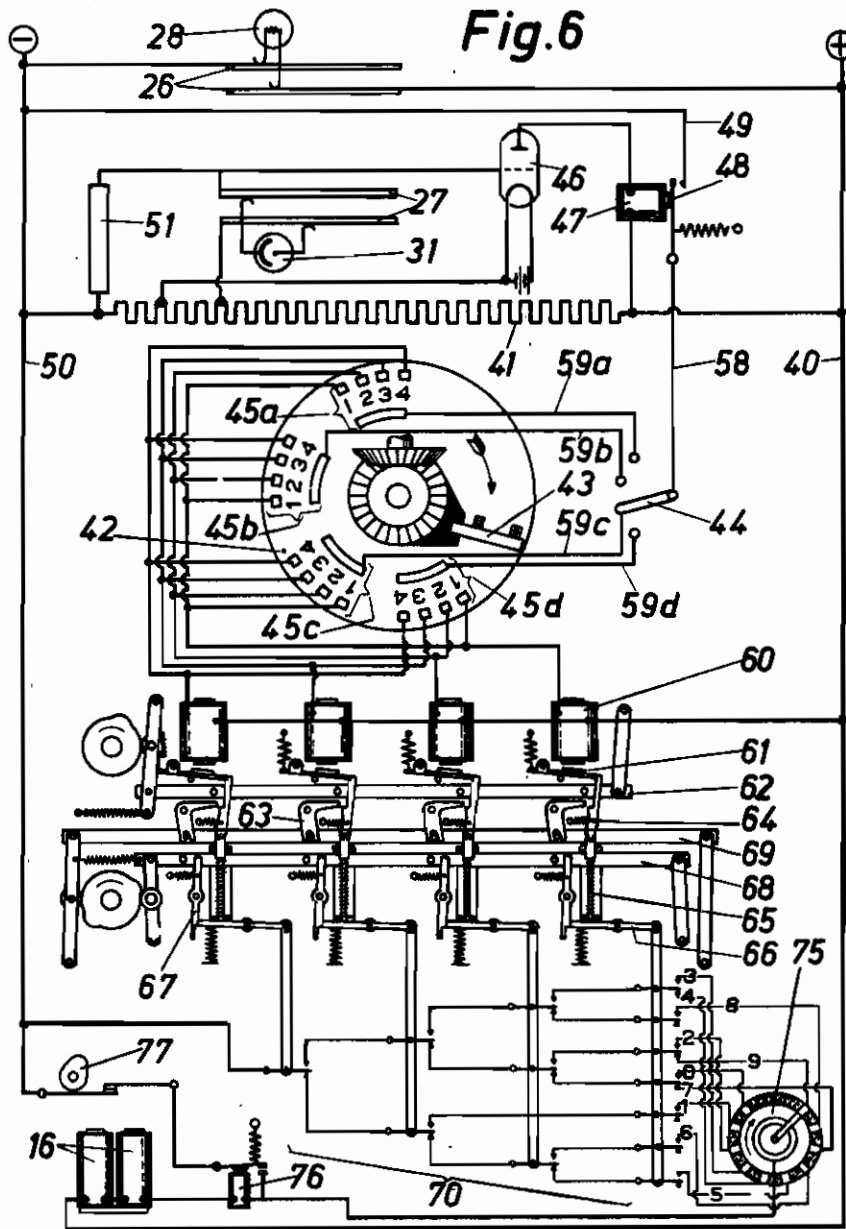
Fig. 5

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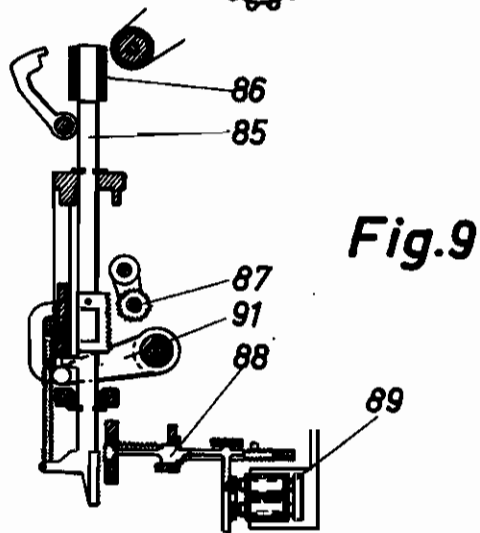
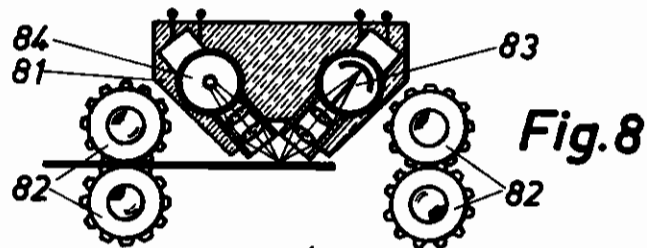
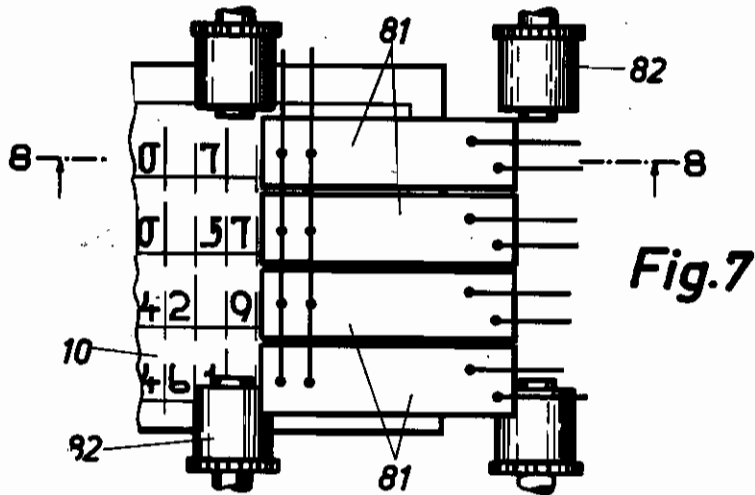
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BY A. P. C.

Filed Sept. 16, 1939

12 Sheets-Sheet 5

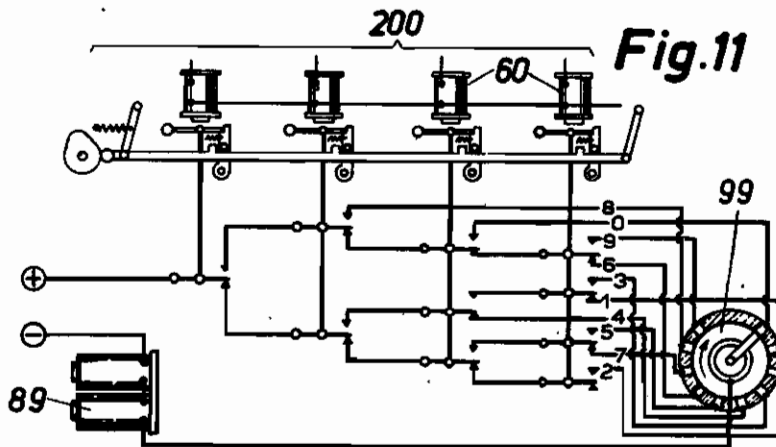
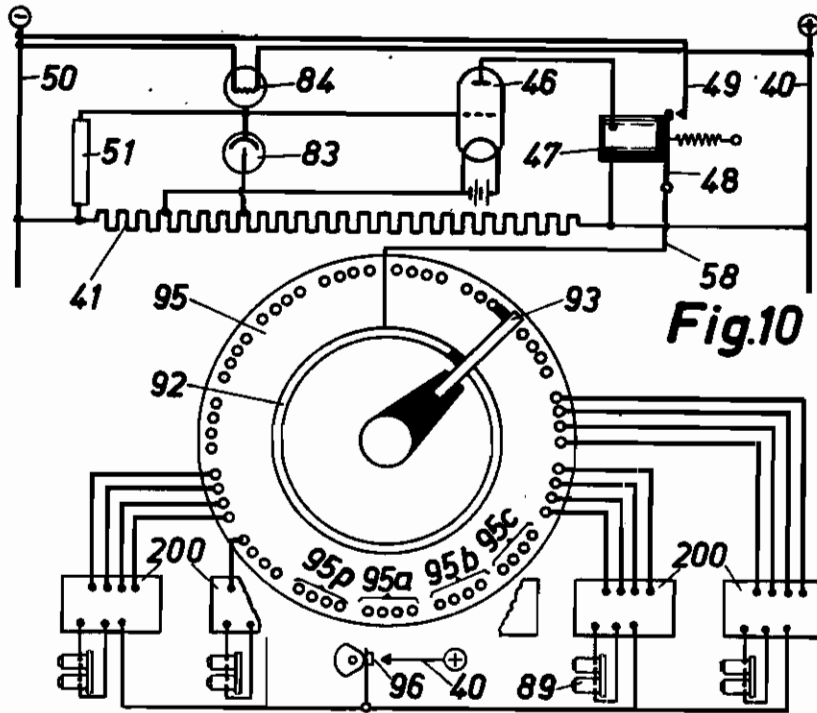


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Fig.12

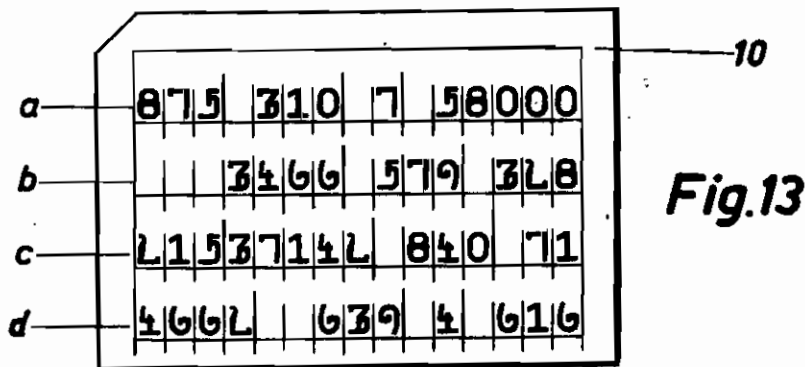
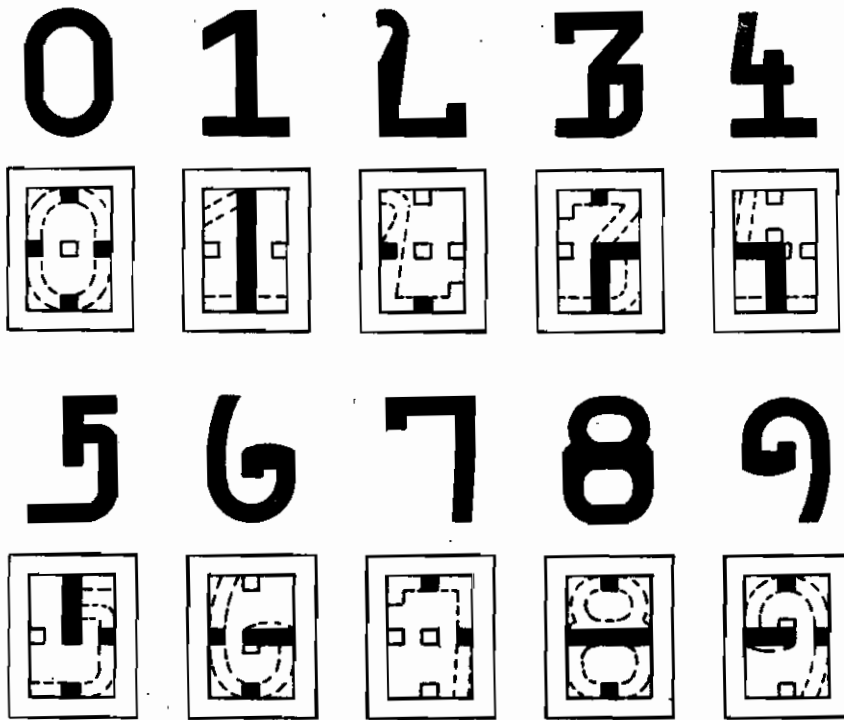


Fig.13

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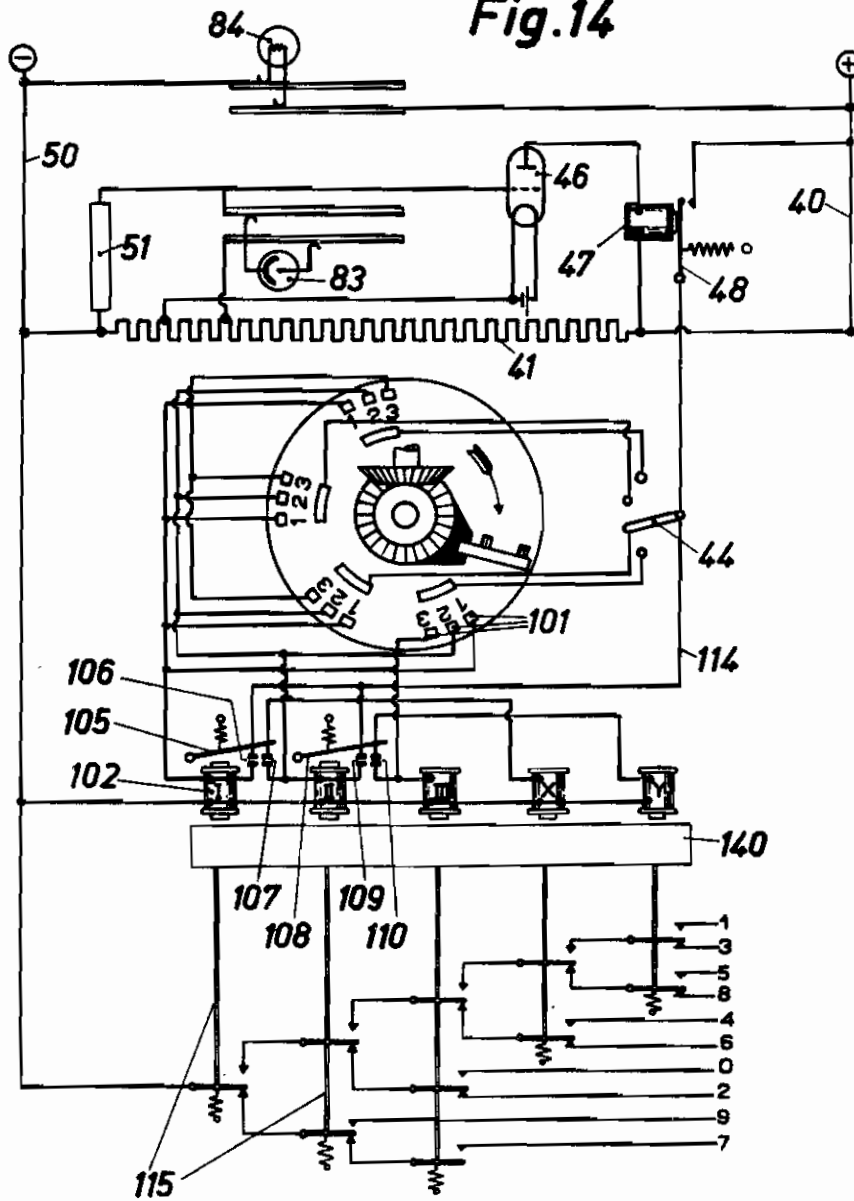
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Fig. 14



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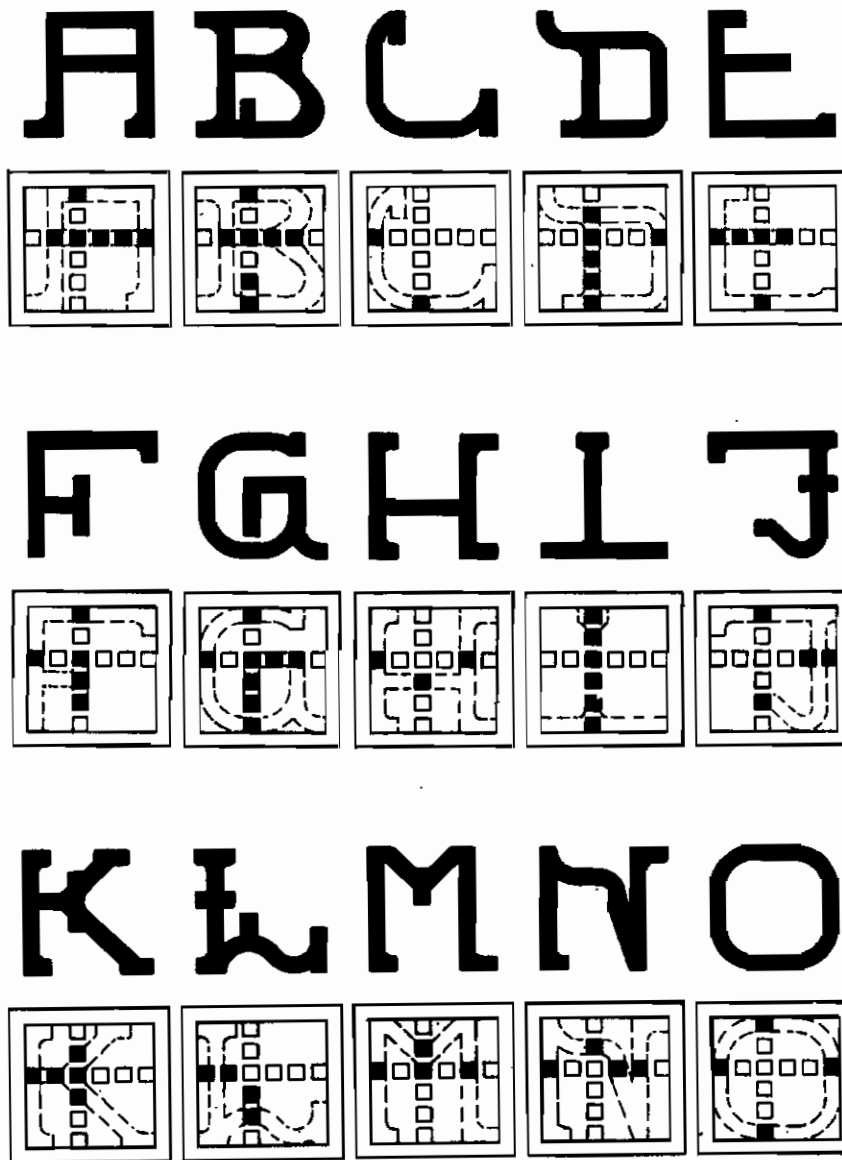


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*Fig. 15a*



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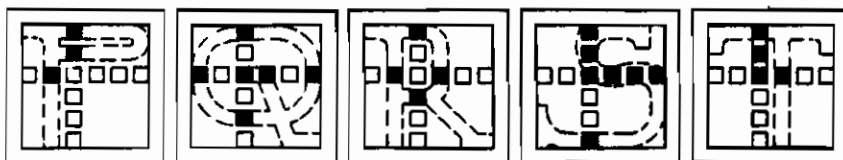
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Fig. 15b

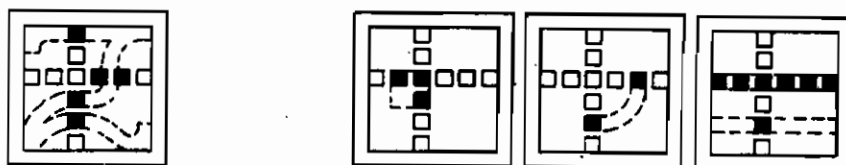
T Q R S T



U V W X Y



Z ■ ) =



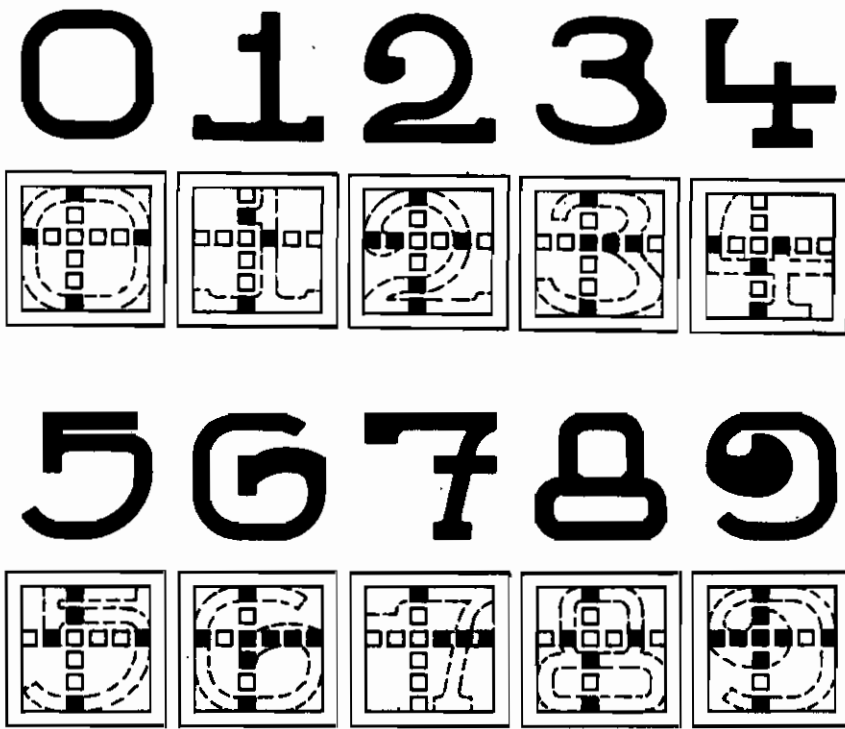
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*Fig. 15c*



*Fig. 16*

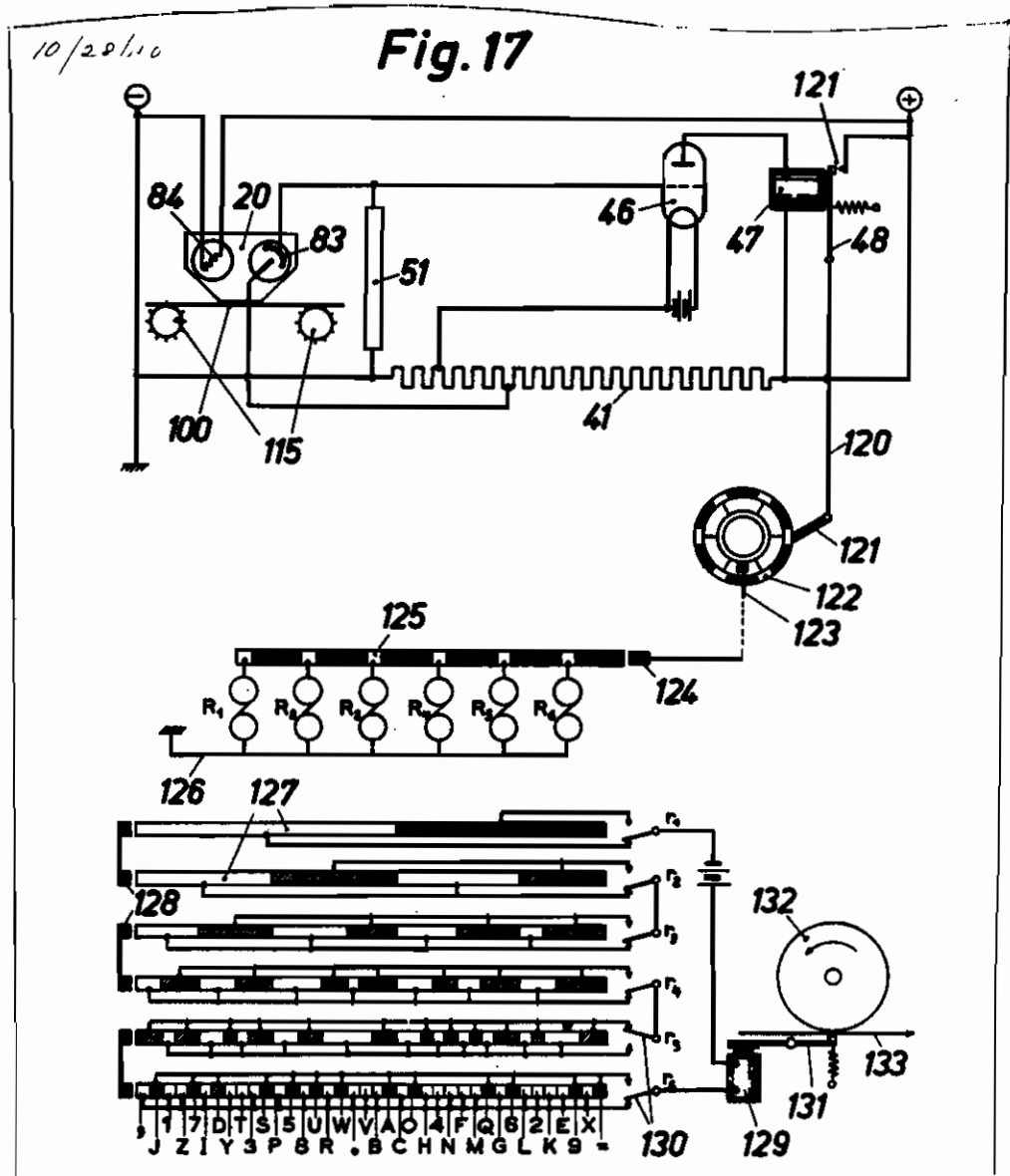
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# ALIEN PROPERTY CUSTODIAN

## RECORD CONTROLLED MACHINE

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vested in the Alien Property Custodian

Application filed September 16, 1939

This invention relates to record controlled machines and more particularly to such machines adapted to be controlled by and in accordance with the graphical characters formed on the control records.

In the art "analysis" of "data-carriers" is effected in many different ways, chiefly in such manner, that the data-carriers supervise the control of machines in a certain manner. Examples thereof are printing telegraphs and type setting machines which are controlled by perforated tapes; the latter represent the data-carriers upon which the data are symbolically provided by perforations. In other branches of the art the data-carriers used for the control are provided in form of tickets or cards. To a large extent particularly in the accounting art in the most general sense, such as for instance in bookkeeping and statistics, the analysis of data provided upon cards takes place, though also in this instance the provision of the data upon tapes has become known. The "analysis" of the data carriers can take place in this branch of art in a different manner, either by ordering according to certain characters or numbers, or by accumulation of the latter ones, or by any other calculatory compilation or handling of the data. Due to their physical provision the data may effect a control of machinery, as it is, for instance, the case in the well known perforated record card system.

Now, it has already been suggested to depart from the perforations for the purpose of representing the data upon data carriers for the control of machinery and to represent the data only by graphical characters and to use the same themselves for the control of machinery; this affords the advantage of a quite considerable saving of paper and the immediate analysis of the easily readable data (see for instance U. S. Patent No. 2,000,403). Since the graphical characters must cause distinct controlling effects depending upon their meaning, of course, they must also differ from each other in a certain manner perceivable by machinery. Among the known suggestions there is now one according to which four predetermined "index-positions" (constituting the "index-position-system") are analyzed in each numerical graphical character provided upon the data carrier; certain positions are covered by the character, and these positions may be designated as index-marks of the graphical character. The configuration of the characters is so chosen that a distinct combination of index-marks is obtained for each character, whereby the graphical character is unequivocally deter-

mined (in this connection also single marks must be understood as "combinations" as is general terminology). Due to the above mentioned distinctness of the configuration of the printed characters, the analysis of the characters photoelectrically and the control of devices in accordance with the meaning of the analyzed characters may then take place.

Accordingly, an object of the present invention resides in the provision of means controlled by the printed characters on suitable data carriers or records, each of the characters having such configuration that the index-marks of the various characters are all upon one and the same straight line and only a single photocell is used for the analysis of a character, which due to the relative movement between the photocell and the data carrier will analyze successively the index positions lying upon the straight line and will cause in accordance with the distinct combinations of the analyzed index-marks the control of a character manifesting machine in a distinct manner.

The successive analysis of the index positions by the single photocell may be caused in various manners by the relative movement between the cell and the index positions. The preferred case is that the data carrier is moved past the photocell. This movement may take place step by step, it is, however, preferably effected by uninterrupted movement of the data carrier in order to increase the operation speed. Machines have also already become known wherein the relative movement between the analyzing means and the data carrier is reverse, i. e. wherein the data carrier is stationary and wherein the analyzing means is moved past said carrier. In a similar manner, of course, also in the present invention the relative movement between the photocell and data carrier could take place if this is deemed desirable. It may be seen that through the arrangement according to the invention an essential simplification is attained insofar as compared with the known suggestion instead of a plurality of photocells only a single one is necessary for the analysis; moreover, under certain circumstances it is also possible to attain through the analysis of the card while the same is in uninterrupted motion an increased operation speed.

In a preferred embodiment of the invention graphical characters are applied whose index-marks are upon a vertical of the characters, and analysis takes place in a simple manner thereby that the characters are moved along this vertical past the photocell, as this is for instance done

with the perforated card columns in record cards upon the passage past a single analyzing brush. However, it has also already become known and it is quite usual for instance in the art of telegraphy, to analyze the characters (for instance hole combinations) of a number or of a word one by one in cross direction of the characters and in the art of perforated record cards this type of analysis is known under the term "endwise analysis." Such an endwise analysis is attained according to the invention by graphical characters so configured that their index-marks are upon a horizontal of the characters and the characters are moved along said horizontal past the photocell. If data carriers are used having characters so chosen that for all characters of a set of characters index-marks are obtained upon a vertical as well as upon a horizontal line, such data carriers may be selectively analyzed in any one of two different manners by moving the characters either along the vertical line or along the horizontal line past the photocell.

Analogous to a known suggestion wherein the hole combinations are formed in a distinct manner by points and slots (see for instance U. S. Patent No. 1,976,352), according to the invention the control of machinery may also be effected by graphical characters wherein the index-marks are formed by point-like as well as by line-like sections of the characters, so that for the identification of the characters distinct combinations of index-points and index-lines are obtained; however, in this instance it is assumed that an index-line extends at least over a length corresponding to two index-positions. Index-points and index-lines pass one by one by the photocell and the analysis takes place in such manner that the analyzing device responds in a distinct manner upon two adjacent index-positions depending thereupon whether they are occupied by two single index-marks or by an index-line of the character.

The control of machinery according to the invention may be applied in various manner as has already been mentioned in the introduction in connection with the known control of machinery by data carriers. In the following therefore only a few embodiments are essentially diagrammatically illustrated and described; namely, the control of a sorting machine for record cards, the control of a tabulating machine for the cards, and the control of a telegraph or teletype printing device by a printed tape.

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

In the drawings:

Fig. 1 shows in a greatly enlarged scale the configuration of the graphical characters applied. In the first and third row the characters themselves are indicated and in the second and fourth row the characters are shown in dotted lines, as well as the associated combination of index-marks in each character.

Fig. 2 illustrates a record card 10, carrying four lines *a*, *b*, *c*, *d* of graphical characters.

Fig. 3 is a diagrammatic view of a sorting machine for record cards according to Fig. 2.

Fig. 4 is a section through the front part of this machine.

Fig. 5 illustrates in an enlarged scale the light-

electric analyzing arrangement for the sorting machine.

Fig. 6 is the wiring diagram of the sorting machine.

Figs. 7, 8, 9, 10 and 11 illustrate essentially diagrammatically a tabulating machine which is controlled by cards according to Fig. 2.

Fig. 7 shows a top view upon the analyzing spot past which the record is fed for "endwise analysis."

Fig. 8 is a section through the analyzing device according to line 8—8 of Fig. 7.

Fig. 9 illustrates the mechanical part of the tabulating machine; namely, the printing device and the accumulator control taking place in accordance therewith.

Fig. 10 shows the wiring diagram of the tabulating machine.

Fig. 11 shows one of the translator devices which are applied in Fig. 10 and which are indicated in the latter figure merely by a casing.

Fig. 12 shows graphical characters in which the index-marks are formed by index-points and index-lines and wherein an index-position-system is provided upon the horizontal and one upon the vertical. The manner of illustration is essentially the same as in Fig. 1.

Fig. 13 shows a record card with the characters illustrated in Fig. 12, said characters being again arranged in four lines *a*, *b*, *c*, *d*.

Fig. 14 illustrates diagrammatically a translator device serving for the analysis of characters according to Figs. 12 or 13 respectively.

Figs. 15*a*, 15*b*, and 15*c* illustrate in a greatly enlarged scale the letters of the alphabet and the numerals as well as some punctuation characters; in the same manner as in the illustration according to Fig. 1, the vertical and the horizontal index-position-system is indicated. Since, however, all characters must be distinct from each other, in the present instance six index-positions are necessary.

Fig. 16 shows a part of the printed tape upon which the characters according to the illustration in Figs. 15*a* to 15*c* are indicated.

Fig. 17 illustrates diagrammatically an arrangement for a telegraph apparatus or teletypewriter which is controlled by a tape according to Fig. 16.

Now, first a sorting machine for cards according to Fig. 2 shall be explained as it is illustrated in Figs. 3 to 6. The sorting machine illustrated in Fig. 3 is provided in the usual manner with ten sorting pockets for the numerals 0 to 9, and an R-pocket for unrecorded cards. The cards 10 are inserted into the magazine. The motor 11 drives by means of the crank drive 12 the reciprocating card gripper knife 13 by which the cards are advanced and are then fed by the feed rollers 14 at first past the analyzing device and then into the sorting pockets. Sorting takes place in the known manner in such way that the cards are fed between sorting chutes 15 and the armature of the sorting magnet 16. The sorting magnet 16 is energized at a differential time corresponding to the meaning of the analyzed character, so that the corresponding chutes ahead of the card can be lowered while the chutes resting upon the card are retained by the same, so that the card will pass between two chutes and will be fed by the rollers 14 into the corresponding pocket. The light-sensitive device is provided on a carrier 20 (Figs. 4 and 5) and is adjustable in a known manner across the card upon the desired card column by means of the spindle 23 rotatable

by a crank 24. The selection of the desired line takes place by a line selector still to be explained.

#### Analyzing arrangement

The carrier 20 accommodating the photocell arrangement has carrying rollers 22, running upon cross bars 21, so that the carrier 20 may be adjustable through the spindle 23 for the purpose of column selection. The photoelectric analyzing arrangement comprises a light source 28 the rays of which are concentrated upon the card 10 by the system 35 of lenses for analyzing the index-positions. Depending thereupon whether a light or dark index-position (in the latter instance accordingly an index-mark) is being analyzed, much or almost no light will be reflected from the card and will be concentrated by the system 30 of lenses which directs the light to the photocell 31; the latter will become effective each time if the value of the light rays projected thereon becomes a minimum. The electric supply to the light source 28 is effected by cross running contact bars 26 on which slide contact pins are resiliently mounted in the carrier 20, and in the same manner the photocell 31 is connected to the cross running contact bars 27.

The operation is now as follows: By means of the line selector 44 the line is selected which shall be effective to control the sorting operations, and then the carrier 20 is adjusted by rotation of crank 24 (Fig. 3) to select the desired column according to which sorting shall take place within the selected line. Then only the character of a single line will be analyzed at one time, and the four index-positions will be analyzed one by one. The sorting impulses initiated by each position (if they are occupied by index-marks) control a translator which governs the sorting chute operation in accordance with the meaning of the characters. In the present embodiment there is also a storing mechanism provided which is known per se (see U. S. patent No. 2,025,602) and which operates as follows: In one analyzing cycle a first storing device is controlled in accordance with the analyzed character; between two operating cycles the setting of the first storing device is transferred to the second storing device and immediately thereafter the first storing device is again restored so that it is free to be controlled by the next card; and while in the next operating cycle the first storing device is controlled by the next card, the sorting chutes are controlled from the second storing device in accordance with the result of the analysis of the preceding card. Before the transfer of the setting from the first to the second storing device the second storing device is restored to normal before a second entry is made.

In the wiring diagram in Fig. 6 the light source 28 movable along the contact bars 26 is connected to the lines 40 and 50. Between these lines a resistance 41 is inserted having connected to one terminal thereof the grid resistance 51 and to the other terminal the relay 47 which in turn is connected to the anode of an amplifier tube 46. Between the said grid element and the resistance 41 there is a parallel circuit connected to the grid resistance 51 including the photocell 31 which is movable along the contact bars 27. Since the light rays impinging on the cell are only interrupted by the dark index-marks of the characters, the relay 47 is always energized (when the machine is supplied with current) and will therefore keep its contact between line 40 and armature 48 open. The line 50 branching from the

armature 48 of relay 47 leads to the line selector 44. Depending thereupon whether a character in the *a*, *b*, *c* or *d* line shall be assorted, this line selector is adjusted to any one of the lines 59a, 59b, 59c, or 59d. A commutator arm 43 in a commutator generally indicated at 42 is moving synchronously with the passage of the index-positions in the focus of the systems of lenses and may establish connections one by one between the four contact pieces in the contact bar of the contact arrangement generally indicated at 45a, 45b, 45c, and 45d. Since the movement of the arm 43 takes place exactly synchronously with the analysis of the index-points, the four translator magnets 60 are connected one by one to the line 50 upon the passage of each line of characters, however, only upon the passage of that line to which the line selector 44 is adjusted. Each time an index-mark passes in the focus of the system of lenses, the armature 48 will temporarily drop and then a flow of current will be established from line 40 to the coordinated translator magnet 60. The energization of the translator magnets 60 is therefore controlled by a character in the selected line of the selected deck and in the same combination as is indicated by the index-mark combination of the analyzed character. If a magnet 60 is energized it will raise its armature 61 so that the pawl 64 belonging to the first storing device will be drawn to the left and after analysis of a character the pawls 64 will be adjusted in the same combination as has been indicated by the index-marks of the character. Now, between two subsequent operating cycles the second storing device must be reset, and after this resetting operation the parts 66 and 67 are in the position as shown in Fig. 6. Shortly thereafter the transfer of the setting from the first to the second storing device will take place. This is effected by positioning the bar 69 to the left by a cam so that the bell crank 63 will press the released pawls 64 by means of bars 65 downwardly and thereby the lever 68 will be engaged behind the pawls 67. In this manner the setting representing the character is now transferred to the second storing device constituted by the parts 66, 67 to which storing device the translator generally indicated at 70 is also associated and which now controls during the second operating cycle the sorting means in accordance with the character analyzed in the preceding operating cycle. The necessary resetting of the second storing device is effected by the cam controlled movement of the bar 68 to the right whereby the parts will again be brought in the position shown in Fig. 6. Resetting of the first storing device which must take place shortly after the said transferring operation is effected by the cam controlled movement of the bar 62 to the right. The lines connected to the translator 70 are analyzed in a known manner by a commutator 75; at the predetermined timed interval corresponding to the meaning of the character the sorting magnet 16 will receive an electrical impulse over the selected translator line so that the card will be fed into the pocket corresponding to the character. The relay 76 establishes a stick circuit for the magnet 16 which is again interrupted by a contact controlled by cam 77.

In Figs. 7 to 11 the tabulating mechanism is diagrammatically illustrated, wherein it has been assumed that, contrary to the analysis in the described sorting machine, an "endwise analysis" of the cards is concerned. As is shown in Figs. 7

and 8, for this purpose there is provided for each numeral line an analyzing device in a carrier 81 so that four analyzing carriers 81 are arranged side by side. These carriers and the light sources mounted therein as well as the photocell must, of course, be comparatively small; however, with the sizes illustrated this is well possible because nowadays photocells and light sources can be manufactured having only a diameter of 10 to 15 mm. Feeding of the cards 10 takes place in cross direction through the feed rollers 82 and in the same manner as has been indicated in Fig. 5 the index-points of a character pass one by one in the focus of the light-responsive system. The light source is here indicated at 94 and the photocell at 83. The difference in the analysis as compared to Fig. 5 is only that in case of Figs. 7 and 8 the index-marks upon the horizontal of a character are analyzed. The mechanical part of the tabulating machine as it may be applied in connection with the analyzing device according to Figs. 7 and 8 is illustrated in Fig. 9 which is well known in the art (see U. S. patent No. 1,791,762). It is assumed that for each column of the card a device according to Fig. 9 is provided consisting essentially of a drive bar 85 having on the upper end a set of types 86 and being provided with a toothed frame adapted to engage into the gear 87 of the counter. The bar 85 is raised by the driver 91. In accordance with the meaning of the character to be entered, the controlling magnet 89 is energized at a differential time to release thereby the locking pawl 88 so that the bar 85 will be locked in its movement. Thereby in a known manner the type of the set of type 86 which corresponds to the analyzed character will be adjusted in printing position and then when the gear 87 is rocked in engagement with the toothed frame, upon the back stroke of the bar 85 the corresponding amount will be entered into the accumulator. The mechanical gear connection which is not illustrated is now provided in such manner that the feed device 82 of Fig. 7 is in operating connection with a device according to Fig. 9 in the following manner: The cards 10 do not follow each other immediately in succession because between the analysis of two cards there is always an idle cycle, i. e. there is a space corresponding to one card. In the first half cycle therefore the analysis of the card and the adjustment of the translators still to be described will take place, while in the second half (in which instance the analyzing device is idle) raising of the controlling bars 85 takes place and therewith printing and entering of the analyzed amounts; the controlling bars are then restored at the end of the second half cycle, as is known in machines of this type. The electrical wiring of this arrangement is diagrammatically indicated in Fig. 10. For each line there is, of course, an analyzing carrier 81 and in the device shown in Fig. 10, only the mechanism necessary for analyzing a single line is shown. The manner of operation follows readily from the previous explanations: When an index-mark is analyzed the relay 47 is deenergized and the contact between 48 and 49 will be closed. The translator magnets will therefore again receive current in accordance with the analyzed index-mark combination over line 58. The line 58 is connected to the ring 92 which is connected through the contact arm 93 one by one with the contact pieces of the set of contact pieces 95p etc. to 95b, 95a of the commutator 95, each of said sets of contact pieces consisting of four pieces.

The four contact pieces 95 are connected to the four translator magnets of a translator unit 200. Accordingly, in the illustrated instance 15 sets 95a to 95p of contacts 95 are provided upon the commutator 95 since one line consists of 15 columns and since, of course, a corresponding number of translator units 200 as well as controlling magnets 89 and controlling bars 85 are also provided for this line; in the drawing, however, only several of them are illustrated. The arm 83 rotates once in the first half of the operating cycle and in the second half it makes a further revolution; however, it may become effective only in the first half cycle since the common line contact 96 is kept closed by a cam only in this first cycle; for, in the second half cycle no cards are analyzed but entry of the stored or analyzed data is effected into the printing and accumulating mechanism. Fig. 11 illustrates a translator device consisting of the translator magnets and the line selectors generally indicated at 200. For reasons of simplicity this translator device is indicated in Fig. 10 only by a rectangle. Each translator unit includes four translator magnets 60 controlling in a known manner selector bars by raising their armature and raising therewith the selector bars which in turn, by means of the contacts provided thereon, will select at one time only one of ten different lines in accordance with the meaning of the analyzed character. In a commutator 99 these lines are analyzed one by one and sooner or later the controlling magnet 89 will be energized which will then supervise the controlling bar 85 (Fig. 9) in accordance with the analyzed character. In the present instance only an ordinary known translator, i. e. a translator without the serial storing device previously explained, is necessary. The adjustment of the translator will take place, as has been assumed, during the first half of the operating cycle and the control of the recording mechanism only during the second half. The translator can then remain adjusted in this second half of the operation cycle and may cause the control of the registering mechanism. It is only after this control has been effected that the translator is restored in a known manner through a restoring bar to its home position so that also the shift bars may again return into the position shown in Fig. 11, while they have been held in raised position during their adjustment by the armatures of translator magnets 60 acting as pawls.

The control of the described sorting and tabulating machine can, however, also be caused by cards according to Fig. 13 in which the characters have a configuration as shown in an enlarged scale in Fig. 12. It is then only necessary to provide three contact spots 101 (Fig. 14) instead of the four contact spots 95 (Fig. 10) and from these three contact spots control impulses must be derived so that the five controlling magnets 102 will receive such adjustment that in the translator lines supervised by said magnets each time only one line; namely, the line corresponding to the analyzed character will be selected. For this purpose a device known per se may be used, as it is for instance described in U. S. patent No. 2,065,864, and which therefore need only briefly be explained herein.

Fig. 14 illustrates the modification of the translator device in the case that the same shall be used in a sorting machine of the type already described and that control shall be effected by cards according to Fig. 13. The photoelectric analysis takes place therein in the same manner



as in the previously described sorting machine by light source 34 and photocell 33 which govern the relay 47. The same controls by its armature 48 a contact over which a current impulse may flow from line 40 to the above mentioned line selector 44. The distributor commutator to which the line selector 44 is in connection depending upon the selected line, has however, in the present instance for each line instead of four only three contact pieces 101, because for each character only three index positions are provided. There are, however, five translator magnets 102 provided. In order to derive an additional controlling effect from the occupation of the index-positions by an index-line, in the present instance a line 114 branches from the line selector 44 which line may be connected by a contact 106 to the magnet 102—I. The magnet 102—II may be connected by a contact 107 to the magnet 102—X; further, the line 114 may be connected by a contact 108 to the magnet 102—II while the magnet 102—III may be connected by a contact 110 to the magnet 102—Y. The contacts 106, 107 are closed by the armature 105 upon energization of magnet 102—I and the contacts 109, 110 through the armature 108 of magnet 102—II. Since the mechanism shall be used for a sorting machine, in the present instance again provision for storing has been made in the form of two storing devices which operate in series. Since, however, this arrangement is the same as in the previously described example, for reasons of simplicity it is indicated in Fig. 14 only by a casing 140. The selection of the translator lines is again effected by shifting of the contacts by means of the shift bars 115 of the translator.

If only index-points are analyzed, the manner of operation follows readily from the previous description because then only the magnets 102—I, 102—II and 102—III are energized. The manner of operation in case of analysis of an index-line will be seen from the following explanation in connection with the analysis of the numeral "1": The numeral "1" is characterized by an index-line extending over all three index-positions, in the present instance, of course, the analysis according to the vertical of the numeral being assumed. Upon the passage of the lowermost index-position the magnet 102—I will therefore be energized and the corresponding shift member in the first storing device will therefore be adjusted. Since, however, the first and the middle index-points are now connected to each other, thus forming an index-line, the armature 48 keeps its contact closed and therefore, though the arm of the commutator will again leave the first contact piece 101, the current over the magnet 102—I will not be interrupted since the same will receive current further on over line 114 and contact 106. If then the middle contact piece 101 is engaged by the commutator arm, the magnet 102—II will receive a controlling impulse. Simultaneously, however, also a controlling impulse will be sent over contact 107 to the magnet 102—X so that the controlling means of the latter will now also be adjusted. Since between the second and third index-position the armature 48 will still keep its contact closed, the magnet 102—II will be energized by the current flow over line 114 and contact 109 and will therefore remain energized. If then the third index-position is analyzed, the magnet 102—III will receive a current impulse. Simultaneously, however, a current impulse will flow over contact 110 to the magnet 102—Y. Therefore, after analysis of a

character all five magnets 102 have been energized. If this adjustment is transferred in the following operation cycle upon the second storing device, all controlling bars 115 will be raised and it will be seen that in this instance actually the line corresponding to the character "1" has been selected. The same may then again cause the control of the sorting chutes in the described manner.

For the remaining characters the controlling operations will take place in a corresponding manner, depending thereupon whether an index-point or an index-line is analyzed. It is, of course, obvious that the arrangement according to Fig. 14 may also be applied in the wiring according to the Figs. 10 and 11, so that a tabulating device for cards according to Fig. 13 is obtained. The wiring of Fig. 14 must then only be adapted to the translator key for the index-marks upon the horizontal.

The Figs. 15a, 15b, 15c illustrate in a greatly enlarged scale the letters of the alphabet, the ten numerals and some punctuation characters. In the same manner as in Fig. 1 the index-position-systems and the index-marks are indicated. It will be seen that two index-position-systems are provided, one upon a horizontal and one upon a vertical, each having six index-positions and all characters differ from each other within their system by distinct combinations of index-marks. In Fig. 16 a portion of a telegraph tape 100 is illustrated. The latter is fed past the analyzing spot in a known manner in cross direction by means of feed rollers engaging into marginal perforations of the tape; analysis is effected in the present instance by a light-responsive analyzing device essentially being of the same type as illustrated in Fig. 5. Therein, of course, only the index-marks upon the horizontal are utilized, however, it will be clear, that for instance in a sorting machine for letters and numerals also the index-marks upon the vertical could be utilized.

The wiring diagram of the telegraph or teletype mechanism is diagrammatically shown in Fig. 17. The tape 100 is fed by feed rollers 115 past the carrier 20 of the photoelectric analyzing device, and if an index-mark of the character is analyzed, the controlling mechanism will become effective and the contact 121 will be closed. Therefore, for each character the impulse emission over the contact 121 will take place in distinct combinations in timed sequence. These controlling impulses may then be transmitted in a known manner by a distributor over a transmission medium, such as a line, to a printing telegraph. Devices of this type are well known so that in the following only diagrammatically a device is referred to corresponding essentially to the Siemens-telegraph, which in the present instance, however, is accommodated to 38 characters without any shifting mechanism. The impulses initiated by the printed tape pass over line 120 and brush 121a to the emitter commutator 122, from which they will be directed to the line 123. At the receiving end there is a device provided, consisting of a receiving contact ring 125 and six translator contact rings 127, whose brushes are moving in a known manner synchronously with the emitting commutator 122 which latter, of course, is in turn synchronized with the feed 115 for the tape 100. Upon the receiving end the impulses will pass from a brush 124 to the receiving ring 125, they will then pass, depending upon the arriving combination

of impulses, through relays  $R_1$  to  $R_6$ , and over line 126 to the ground. Each of the relays  $R_1$  to  $R_6$  has two coils and the coils operate alternately in such manner that the one set of coils takes up the arriving combination of impulses while the other set of coils causes shifting of the contact levers 130r<sub>1</sub> to 130r<sub>6</sub> coordinated to the relays. These contact levers establish connections to the translator rings 127 which in turn are connected to each other in the illustrated manner by brushes 126. The parts 127 constitute in effect, as has been mentioned, contact rings, however, for reasons of better illustration they are shown in the present instance in the usual manner in development. These contact rings are divided in contact segments insulated from each other, some of which are indicated in the present instance shaded and some unshaded in order to make the division clearer. Accordingly, the shaded portions are also conducting and are no insulations. If the armature levers 130r<sub>1</sub> to 130r<sub>6</sub> are shifted in the combination determined by the analyzed character, there

will be only a single current path over the contact rings 127 at a certain moment which path corresponds to the respective character. Synchronously with the brushes of the contact rings 127 rotates the typewheel 132 upon which the types are provided in the sequence indicated on the lowermost contact ring. If the printing magnet 129 is energized, the hammer 131 will impel the paper tape 133 against the typewheel 132 so that the type which is just passing will be printed. The magnet 129 will be energized at the moment determined by the selection of the lines and at this moment also the type corresponding to the analyzed character is just in printing position and will be printed upon the tape 133.

The essential features of the invention have been explained before in connection with some applications of the invention, however, it will be understood that the provisions according to the invention may be applied in all instances where the control of machinery by graphical characters is concerned.

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