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 TYPEWRITING MACHINE.

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1,395,049.

Patented Oct. 25, 1921.

FIG. 1.

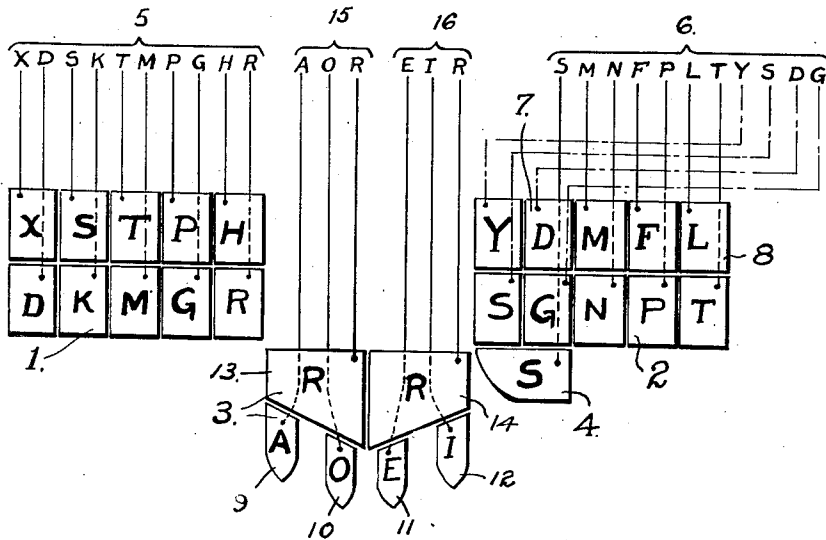
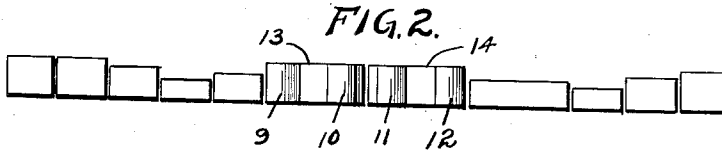


FIG. 2.



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## TYPEWRITING-MACHINE.

1,395,049.

Specification of Letters Patent.

Patented Oct. 25, 1921.

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*To all whom it may concern:*

Be it known that I, CHARLES E. McNAMARA, a citizen of the United States, residing at Minneapolis, in the county of Hennepin and State of Minnesota, have invented certain new and useful Improvements in Typewriting-Machines, of which the following is a specification.

My invention relates to a typewriting machine of the class of machines intended particularly for such rapid recording of speech as is attained by the employment of hand written shorthand systems. In machines of this type the keys are intended for simultaneous manipulation. The object aimed to be accomplished is to enable the operator, phonetically or according to spelling, to write at one stroke an entire word, or as much of the word as possible, or a succession of words or word-signs. The keys, simultaneously pressed, produce a sequence of printed letters or characters on the record, and the record is moved on one step after each stroke in readiness for a new series of letters to be produced by the next stroke.

The most essential requirements to the success of a machine of this type is rapidity and facility in the manipulation of the keys; and it is the primary object of this invention to provide, in a machine of this character, certain novel arrangements of the printing units and their manipulating keys, whereby the machine may be operated at a maximum speed and convenience. To produce such a relative key arrangement as will permit of recording the greatest number of complete words or phrases, or syllables of a word, as the case may be, at one stroke, with the minimum number of individual key depressions and with the minimum demand for digital dexterity is the primary purpose of this invention.

The invention is illustrated, somewhat diagrammatically, in the accompanying drawing, wherein—

Figure 1 shows, in plan view, the keyboard constructed and arranged in accordance with the invention, the figure showing schematically the printing operations performed by the machine; and

Fig. 2, a side elevation of the key-board. In the key-board shown the keys are divided into three banks: A bank 1 adapted to be manipulated by the left hand of the operator and consisting preferably, though not

necessarily, of ten keys arranged in two rows, one in front of the other, with the letter designations as shown in the drawing; a bank 2 for manipulation by the right hand of the operator consisting also preferably, though not necessarily, of ten keys arranged in two rows with the letter designations as shown; and a third bank of keys 3, preferably arranged forwardly of the other two banks and between the same; in addition to which the arrangement contemplates, preferably, an additional key 4 arranged in front and at the left-hand corner of bank 2.

The keys of bank 1 are associated, respectively, with the printing units adapted for printing the initial consonant letters of words, "initial" meaning in this connection consonants or characters standing for consonant sounds appearing in the first part of a word or combination of words, or combination of a word and word-signs, or the combination of word-signs, that is, the consonants appearing in the first part of the sequence of letters printed at one stroke of the machine. At 5 is indicated the sequence in which the letters produced by the initial consonant keys would appear on the record if all of the keys of bank 1 were struck simultaneously. It will be seen that the sequence on the record corresponds throughout to the serial order of the keys in the bank, the upper left-hand key forming the first term of the series, the lower left-hand key the second term, and so on throughout the bank.

The keys of bank 2 are operated by the right hand of the operator simultaneously with the keys of bank 1 which are manipulated by the left hand, to print the terminal consonant or consonants of the word syllable or word combination, "terminal" meaning in this connection consonants appearing in the latter portion of the word or combination. By comparison with the sequence of letters indicated at 6, printed by the terminal consonant keys, with the serial arrangement of such keys in the bank, it will be seen that these sequences do not correspond. The keys of bank 2 may be divided into two groups, group 7, consisting preferably of keys lettered Y, S, D, G, and arranged at the left-hand side of the bank, these keys being associated with printing units adapted to print these letters in this order but at the right-hand end of the sequence of letters

printed by the printing units with which the other keys,—group 8, lettered M, N, F, P, L, T, are associated; that is, while each group of units prints letters in sequence corresponding to the serial arrangement of the keys in the group, the order in which the two groups of letters occur in the printed sequence is the reverse of the arrangement of the groups in the bank. The group 7 units print letters appearing most frequently as final letters in words. The keys of this group which, for convenience, we have termed somewhat arbitrarily the final letter group, are placed so that they may be manipulated by the forefinger of the right hand. It is a distinct advantage to have these final letters, which must appear at the extreme right-hand side of the record, printed by keys manipulated by the forefinger. The forefinger is stronger and more dexterous than the little finger or ring finger, and can be used with greater ease, more speed and accuracy, and it is desirable to give the greatest degree of speed and accuracy of manipulation to the keys most frequently used. Besides this, as the letters in question are used to show tense of verbs, number in nouns, and other significations produced by word endings, it is a distinct advantage to have all the letters most commonly used for this purpose grouped together in one place.

The group 8 units, which for convenience may be called the penultimate consonant units, are designed to print the consonants which occur very frequently as the final letters of root words. These letters might, therefore, be properly called penultimate consonants in words having suffixes. These suffix consonants are printed by the group 7 units as stated.

It will be understood that in a machine of this type it is not the intention to reproduce all of the letters. Certain letters of the alphabet are represented by combinations of letters printed so as to appear one after the other on the record.

The bank designated 3, and termed, for convenience, the vowel bank, consists, preferably, of four vowel keys 9, 10, 11 and 12; and two consonant keys 13 and 14. The fifth vowel and various other vowel sounds may be made by combining letters printed by the four vowel keys shown. These vowel keys are preferably designated as shown and in the order given, but this is not essential. The consonant keys 13 and 14 of this group are associated with printing units which print preferably the same consonant. As to which consonant will be used in this connection is a matter of discretion, but there is, I believe, a distinct advantage in having these keys print the letter R, and in the sequences with respect to the vowels indicated at 15 and 16. That is, on the record,

the letter R, printed by the unit 13 follows A and O printed by the manipulation of keys 9 and 10. Similarly the letter R printed by the unit 14 follows vowels E and I. The arrangement of keys 9, 10 and 13 is preferably such that the R key may be manipulated by the same stroke of the left-hand thumb which presses either the A or O key, or which presses down these keys together. The arrangement is similar with respect to the keys 11, 12 and 14 which are manipulated by the right-hand thumb. In order to make this manipulation convenient and accurate, the adjacent edges of each R key and the vowel keys directly in front of it are formed on a line oblique to the keyboard, and preferably some space is allowed between the A and O keys and the E and I keys to allow the thumb to be extended up to the R key without accidentally striking the other vowel key.

Key 4 is arranged directly below the group of final consonant keys and is associated with a printing unit designed to print a consonant frequently occurring as a penultimate consonant as well as a final consonant. For example, if one of the final consonant units prints the letter S and the unit corresponding to key 4 also prints S, an arrangement will be provided for printing in one stroke a number of plural words or other words ending in S which contains S as a penultimate consonant.

In order to further facilitate the operation of the machine, the keys are preferably constructed or arranged so that their upper surfaces stand at different levels corresponding approximately to the relative lengths of the fingers intended to manipulate them. A typical arrangement in this regard is illustrated in Fig. 2, in which the four left-hand keys of bank 1, the two right-hand keys of bank 2 (these keys being operated by the little finger ordinarily), and the entire vowel bank, including the R keys (which are operated by the thumbs), have their upper surfaces at a maximum height. The T, M keys of bank 1 and the F and P keys of bank 2 are one step lower. On the next level are the H and R keys of bank 1 and all four keys of the final consonant group of bank 2, viz., Y, S, D, G, and also the additional S key numbered 4, which latter though functionally is a penultimate consonant key, is locally grouped with the final consonant keys. The P, G keys of bank 1 and the M, N keys of bank 2 are stepped down still farther. These arrangements might be varied in the discretion of the manufacturer of the machine or to suit the requirements of the particular operator.

It will be understood that the arrangement of the letter designations of the individual keys in their respective groups or banks has been worked out with a view, hav-

ing reference to the spelling of words most commonly used, the use of word-signs, the combination of the key letters to indicate letters not separately represented on the key-board, and the possibility of combining words or signs in a single character sequence, so that the machine, when operated in accordance with the system for which it is designed, will be capable of the greatest possible speed, ease, convenience of manipulation and accuracy in the record produced. It is not possible to detail all of the considerations which have given rise to the particular letter arrangement shown. Nor is my invention confined to this particular arrangement although I believe that it is the best arrangement possible, having all considerations in view.

Certain salient characteristics of my system can be illustrated with reference to particular words. In giving these examples the keys pressed will be recited in the order in which they appear on the key-board from left to right.

Word.	Left-hand bank.	Vowel bank.	Right-hand bank.		Record.
			Final.	Penultimate.	
(1) Extreme.	X T R	E		M	XTREM
(2) Deprive.	D P R	I		F	DPRIF
(3) Arrears.		A R E R	S	S	ARERS
(4) Contrarily.	*K T R	A R I	Y	L	KTRARILY
(5) Treated.	T R	E	D	T	TRETD
(6) Fishes.	†T P	I	S	NP	TPINPS
(7) Killing.	K	I	†G	L	KILG
(8) Commencing.	K M	E	SG	N	KMENSG
(9) Doses.	D	O	S	S	DOSS
(10) Casting.	K	A	G	ST	KASTG

\*K being the sign for con.  
 †Tp standing for F and NP for SH.  
 ‡G being the sign for ing.

Examples (1) and (2) illustrate the importance of placing the letters X and D at the extreme left of the left-hand bank so that they may be used at one stroke with any of the other letters of this bank in forming any of the large class of words having the prefixes Ex and De followed by roots commencing with a consonant.

Example (3) illustrates the value of the arrangement of the R keys in connection with the vowel bank. This word is typical in its structure of a great many similar words. Another advantage of placing the R in the vowel group is that it makes place for another consonant on the right consonant bank, thereby permitting of combinations that could not otherwise be made at a single stroke without increasing the number of keys.

Example (4) illustrates the same feature. This example, and also examples (5), (6) and (7) illustrate the advantage of having final letters like Y and S, which are of frequent occurrence, within the range of the forefinger.

To further emphasize the advantages of so placing the letters of bank 7 with relation to bank 8, let it be assumed that the letter arrangement of bank 2 did not involve the reversal of position of the two groups, which is one of the characteristics of my invention; in other words, assuming the letter arrangement to be as follows,

M F L Y D  
 N P T S G,

the writing position of the respective fingers being little finger for letters D and G; ring finger for letters Y and S, middle finger for L and T, and F and P, M and N struck by the forefinger. Now, for instance, to write the word "dumping" the operation would be as follows: The little finger of the left hand would strike the letter D (the left-hand bank being assumed to be as shown in the drawing herein), the right-hand thumb would strike together E and I—representing U. The forefinger of the right hand would strike the letter M, the middle finger the letter P, and the little finger the letter G. This is an awkward position and involves the movement of the hand from its normal position on the key-board, entailing loss of speed and possibly accuracy. In the normal position of the right hand in a machine of this sort, the little finger will be over the right-hand pair of keys, the ring finger the next pair of keys to the left, the middle finger the next succeeding pair of keys, and the forefinger over the pair of keys fourth from the right-hand end of the bank and second from the left-hand end of the bank. To write the word "dumping" the forefinger would have to move to the extreme left-hand pair of keys and the middle finger be moved from its normal position to manipulate one of the second keys.

A machine of this type is intended to be operated by the touch system. If the hand is moved from its normal position the operator is liable to lose the relative key relation involving loss of rapidity or possible error in the record. In the letter arrangement of the right-hand bank, in accordance with my invention, the position of the hand is not changed, the little finger, ring finger and middle finger always operating the same pair of keys. The forefinger operates the four left-hand keys and is sufficiently flexible and dexterous to do this without inconvenience. The movement of the forefinger from its normal position to manipulate the Y and S keys is comparatively slight.

Example (8) shows the use together of two keys of the final letter group of the right bank, namely, the letters S, G.

In examples (9) and (10) the advantage of having an S in the penultimate group as well as in the final letter group is made apparent.

While I have described my invention in

certain preferred arrangements, it will be understood that I do not consider it so limited, there being certain principles involved in the invention which are susceptible of a variety of different embodiments.

I claim:

1. In a typewriting machine of the character described, printing units adapted for printing simultaneously and selectively different combinations of characters in an invariable sequence which approximates the order in which the sounds represented by said characters most frequently occur in speech, said printing units comprising keys for manipulation by one hand having an arrangement different from the printed sequence, in which the keys are disposed so that those which are most frequently operated in making said combinations are in position to be manipulated by a digit which is more dexterous than other digits of the hand, and in which keys which are less frequently used are disposed so as to be manipulated by less dexterous digits.
2. In a typewriting machine of the character described adapted for printing simultaneously different selected combinations of characters in an invariable sequence comprising keys manipulated by the forefinger of the right hand which print characters representing the most frequently occurring final sounds of words appearing in said sequence after characters printed by other fingers of the same hand.
3. In a typewriting machine of the character described adapted for printing simultaneously different selected combinations of characters in an invariable right to left sequence, the characters appearing in the latter part of which will be most frequently occurring final sounds of words, comprising keys adapted to be manipulated by the right hand and arranged in a right to left sequence in which the keys used to print characters appearing in the latter part of the printed sequence have a position in the key sequence in advance of the keys which are used to print characters appearing earlier in the printed sequence.
4. In a typewriting machine, printing units adapted for simultaneous manipulation by the right hand of the operator and provided with keys arranged in two adjacent groups, the units of one group adapted to print characters representing the most frequently occurring final sounds of words in a position, relative to the characters printed on the record by the other group, which is the reverse of the positions of the groups of keys with relation to each other, the units of each group being adapted to print characters in the same order as their respective key arrangements.
5. In a typewriting machine, printing units adapted for simultaneous manipula-

tion by the right hand of the operator and provided with keys arranged in two groups placed side by side, each of the units of the left group being adapted to print characters representing the most commonly occurring final sounds of words at the right on the record of the characters printed by units having keys in the right group.

6. In a typewriting machine, printing units adapted for simultaneous manipulation by the right hand of the operator and provided with keys arranged in two groups placed side by side, the units of the left group being adapted to print characters representing the most commonly occurring final sounds of words on the right-hand side of the record in sequence corresponding to the character sequence of the keys of said group, and the keys of the right group adapted to print characters on the left-hand side of the record in sequence corresponding to the character sequence of its keys.

7. In a typewriting machine, printing units adapted for simultaneous manipulation by the right hand of the operator and provided with keys arranged in two groups placed side by side, the units of the left group being adapted to print characters representing the most commonly occurring final sounds of words on the right-hand side of the record in sequence corresponding to the character sequence of the keys of said group, the keys of the right group adapted to print characters on the left-hand side of the record in sequence corresponding to the character sequence of its keys, and an additional printing unit having a key arranged in front of the aforesaid left group of keys, which prints a character representing a sound commonly appearing in the first part of a word on the left side of the record.

8. In a typewriting machine, printing units adapted for simultaneous manipulation by the right hand of the operator and provided with keys arranged in two groups placed side by side, the units of the left group being adapted to print characters representing the most commonly occurring final sound of words on the right-hand side of the record in sequence corresponding to the character sequence of the keys of said group, the keys of the right group adapted to print characters on the left-hand side of the record in sequence corresponding to the character sequence of its keys, and an additional printing unit having a key arranged in front of the aforesaid left group of keys, which prints a character representing a common initial sound on the left side of the record in advance of the letters printed by said right group of units.

9. In a typewriting machine, printing units adapted for printing, by simultaneous operation, terminal consonants in the fol-

lowing order, M N F P L T Y S D G, and having keys arranged in series as follows, Y S D G M N F P L T.

10. In a typewriting machine, printing units adapted for printing, by simultaneous operation, terminal consonants in the following order, M N F P L T Y S D G, having keys arranged in two rows, one above the other,

Y D M F L  
S G N P T,

and a unit for printing the letter S in advance of the aforesaid printed sequence, the key of which is arranged below the aforesaid S key.

11. In a typewriting machine, printing units for printing initial consonants, by simultaneous operation, in the following sequence, X D S K T M P G H R, and having keys arranged in the same sequence.

12. In a typewriting machine, a group of printing units adapted, by simultaneous operation, for printing vowel letters and provided with adjacently arranged keys, and a printing unit for printing a consonant commonly occurring with said vowels in said group having a key arranged substantially contiguous with the vowel keys so that the digit manipulating one of the vowel keys can, at the same stroke, press said consonant key.

13. In a typewriting machine, printing units adapted, by simultaneous operation, for printing vowel letters and provided with adjacently arranged keys, and a unit for printing a consonant commonly occurring with said vowels having a key arranged substantially contiguous with the vowel keys so that one digit of the operator's hand at a single stroke can manipulate a plurality of vowel keys and the single consonant key.

14. In a typewriting machine, printing units adapted, by simultaneous operation, for printing vowel letters and provided with adjacently arranged keys, and a unit for printing a consonant having a key arranged substantially contiguous with the vowel keys so that the digit manipulating one of the vowel keys can, at the same stroke, press the consonant key, the consonant unit being adapted to print on the record at the right-hand side of the letters printed by the vowel units.

15. In a typewriting machine, two consonant printing units which print the same consonant having keys arranged side by side, and four vowel printing units having keys arranged two substantially contiguous with one of the consonant keys, and two contiguous with the other of the consonant keys, so that one consonant key and the two corresponding vowel keys may be pressed by one finger.

16. In a typewriting machine, two con-

sonant printing units having keys arranged side by side, and four vowel printing units having keys arranged two in front of and substantially contiguous with one of the consonant keys, and two in front of and contiguous with the other of the consonant keys, each vowel key arranged so that it may be pressed with the corresponding consonant key by one finger, the vowel keys adapted to print four different vowels and the consonant key the same consonant.

17. In a typewriting machine, two consonant printing units having keys adapted to print the same consonant and having keys arranged side by side, and four vowel printing units adapted to print four different vowels and having keys arranged two in front of and adjacent to one of the consonant keys and two in front of and adjacent to the other of the consonant keys, the consonant unit adapted in each case to print on the record at the right of the letters formed by the vowel units with which it is grouped.

18. In a typewriting machine, a plurality of printing units having adjacently arranged keys, two of which are arranged in front of another key in the key-board, and the keys so arranged having their adjacent edges formed on a line oblique to the key-board.

19. In a typewriting machine, two printing units having keys arranged side by side, with their front edges slanting from their adjacent corners in a direction away from the front of the machine, and a plurality of units having keys arranged in front of each of the aforesaid keys, with their edges adjacent the aforesaid keys formed on oblique lines corresponding to the front edges thereof.

20. In a typewriting machine, printing units adapted for simultaneous operation, having keys arranged as follows,

R R  
A O E I

and adapted to print in the following order, A O R—E I R.

21. In a typewriting machine of the character described, initial consonant printing units adapted, by simultaneous manipulation, for printing initial consonants in sequence, and provided with keys arranged in a corresponding sequence, the first two keys of which being associated with units for printing the letters X and D.

22. In a typewriting machine of the character described, penultimate consonant printing units having keys grouped together and arranged for manipulation by the right hand, final consonant printing units having keys, to be manipulated by the same hand, arranged at the left of the first group but adapted to print on the record at the right-

hand side of the letters printed by the first named group of units.

23. In a typewriting machine of the character described, penultimate consonant printing units having keys grouped together and arranged for manipulation by the right hand, final consonant printing units having keys, to be manipulated by the same hand, arranged at the left of the first group but adapted to print on the record at the right-hand side of the letters printed by the first named group of units, each group of units adapted to print the letters in the sequence of its key arrangement.

24. In a typewriting machine of the character described, penultimate consonant printing units having keys grouped together and arranged for manipulation by the right hand, final consonant printing units having keys, to be manipulated by the same hand, arranged at the left of the first group but adapted to print on the record at the right-hand side of the letters printed by the first named group of units, one unit of each group being adapted to print the same letter.

25. In a typewriting machine of the character described, penultimate consonant printing units having keys grouped together and arranged for manipulation by the right hand, final consonant printing units having keys, to be manipulated by the same hand, arranged at the left of the first group but adapted to print on the record at the right-hand side of the letters printed by the first named group of units, one unit of each group being adapted to print the letter S.

26. In a typewriting machine of the character described, printing units adapted to print initial and terminal consonants in the following sequence, X D S K T M P G H R—S M N F P L T Y S D G, and provided with keys in the following arrangement,

X S T P H—Y D M F L  
D K M G R—S G N P T

27. In a typewriting machine of the character described, printing units adapted to print letters in the following sequence, X D S K T M P G H R A O R E I R S M N F P L T Y S D G, and provided with keys in the following arrangement,

X S T P H Y D M F L  
D K M G R S G N P T  
S  
R R  
A O E I

28. In a typewriting machine of the character described, initial consonant printing units provided with keys arranged in a bank at the left-hand side of the key-board, vowel printing units provided with keys arranged centrally of the key-board, terminal consonant printing units provided with keys arranged in a bank at the right-hand side of

the keyboard, and a terminal consonant printing unit provided with a key grouped with the vowel keys so as to be operated therewith.

29. In a typewriting machine of the character described, initial consonant printing units provided with keys arranged in a bank at the left-hand side of the key-board, vowel printing units provided with keys arranged centrally of the key-board, final consonant printing units and penultimate consonant printing units having keys arranged in a bank at the right-hand side of the key-board, the former being grouped at the left-hand side of the bank and the latter at the right-hand side of the bank, and a penultimate consonant printing unit having a key grouped with the vowel keys.

30. In a typewriting machine of the character described, initial consonant printing units provided with keys arranged in a bank at the left-hand side of the key-board, vowel printing units provided with keys arranged centrally of the key-board, final consonant printing units and penultimate consonant printing units having keys arranged in a bank at the right-hand side of the key-board, the former being grouped at the left-hand side of the bank and the latter at the right-hand side of the bank, and a unit for printing the letter R having a key grouped with the vowel keys.

31. In a typewriting machine of the character described, initial consonant printing units provided with keys arranged in a bank at the left-hand side of the key-board, vowel printing units provided with keys arranged centrally of the key-board, final consonant printing units and penultimate consonant printing units having keys arranged in a bank at the right-hand side of the key-board, the former being grouped at the left-hand side of the bank and the latter at the right-hand side of the bank, and a unit having a key arranged at the left-hand side of the right-hand bank but adapted to print on the record to the left of the impressions made by the penultimate consonant units.

32. In a typewriting machine of the character described, initial consonant printing units provided with keys arranged in a bank at the left-hand side of the key-board, vowel printing units provided with keys arranged centrally of the key-board, final consonant printing units and penultimate consonant printing units having keys arranged in a bank at the right-hand side of the key-board, the former being grouped at the left-hand side of the bank and the latter at the right-hand side of the bank, and a unit having a key arranged adjacent to two of the final consonant keys so that it may be pressed at the same stroke of the digit with either or both of said final consonant keys.

33. In a typewriting machine of the character described,

acter described, final consonant printing units adapted, by simultaneous manipulation, for printing final consonants in sequence, and provided with keys arranged in a corresponding sequence, the keys of which are associated with units for printing the letters Y S D G.

5 adapted for printing characters in a given sequence by simultaneous manipulation and provided with keys, the keys controlling the final consonant printing units located in a position relative to the other keys which is the reverse of the positions of the printed characters.

10  
15

34. In a typewriting machine, printing units, a portion of which are final consonants

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