Nov. 2, 1965 N. ZANABONI 3,215,246

TYPEWRITER COMPRISING IMPROVED KEYBOARD AND ASSOCIATED PRINTING MEANS

Filed Dec. 10, 1962 5 Sheets-Sheet 1

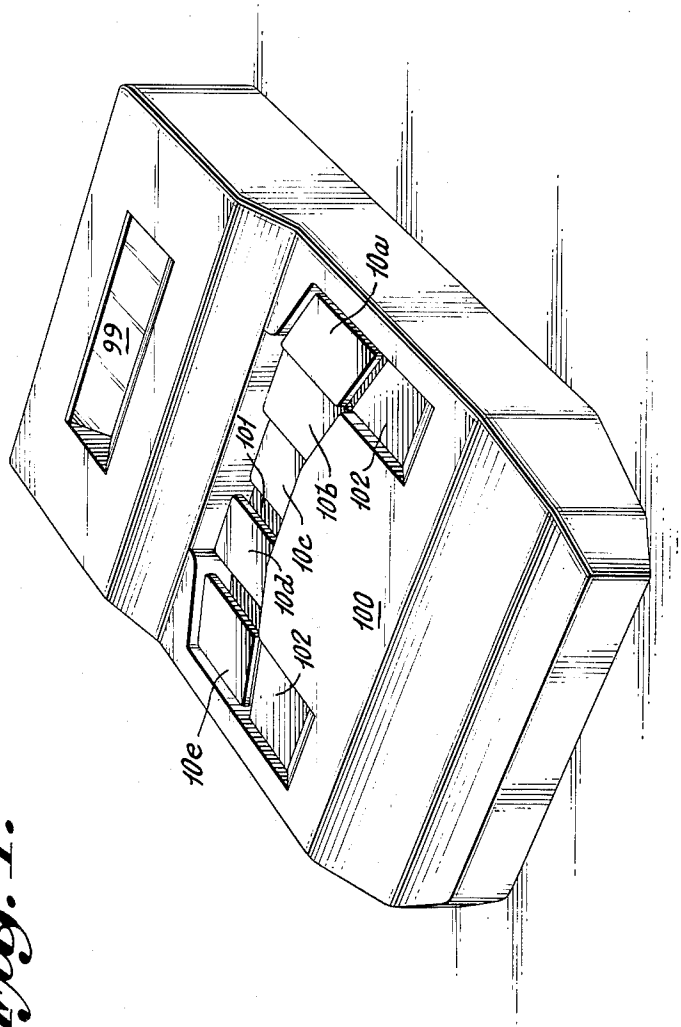

Fig. 1.

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Filed Dec. 10, 1962 5 Sheets-Sheet 2

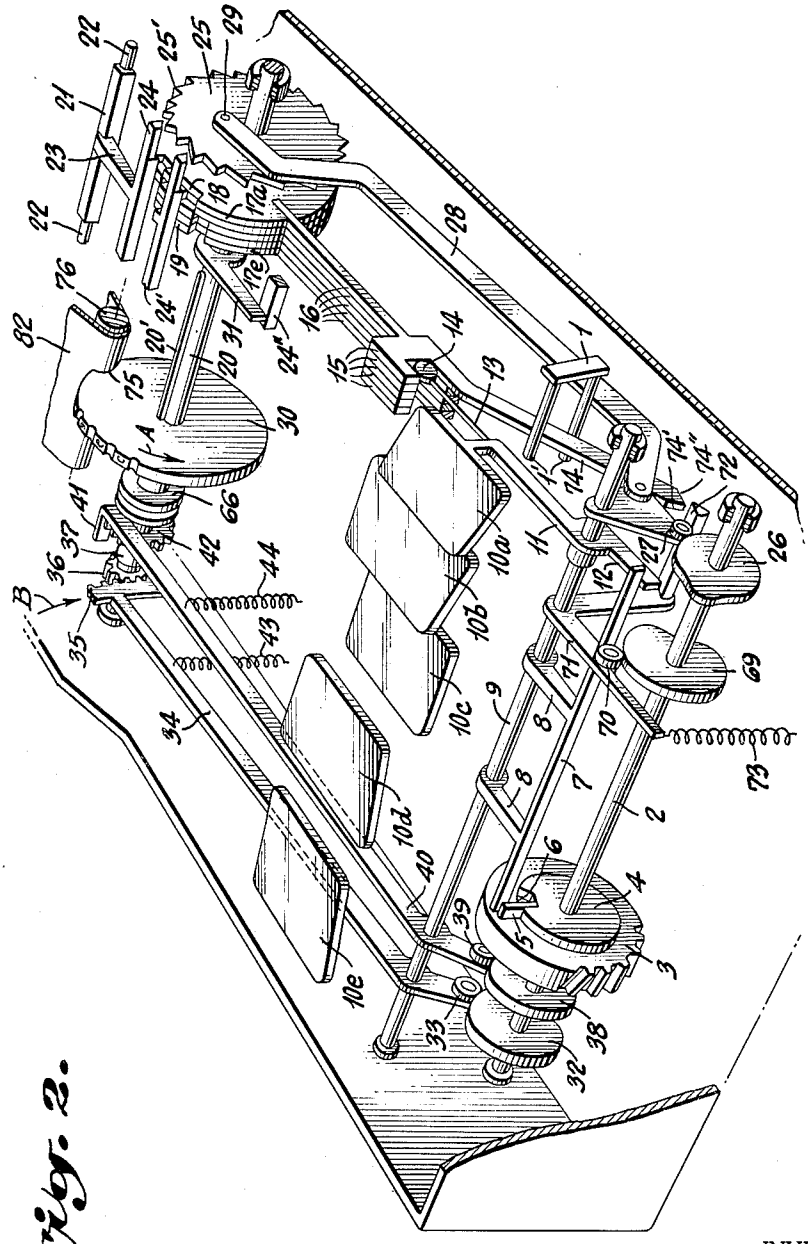

Fig. 2.

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TYPEWRITER COMPRISING IMPROVED KEYBOARD AND ASSOCIATED PRINTING MEANS

Filed Dec. 10, 1962 5 Sheets-Sheet 3

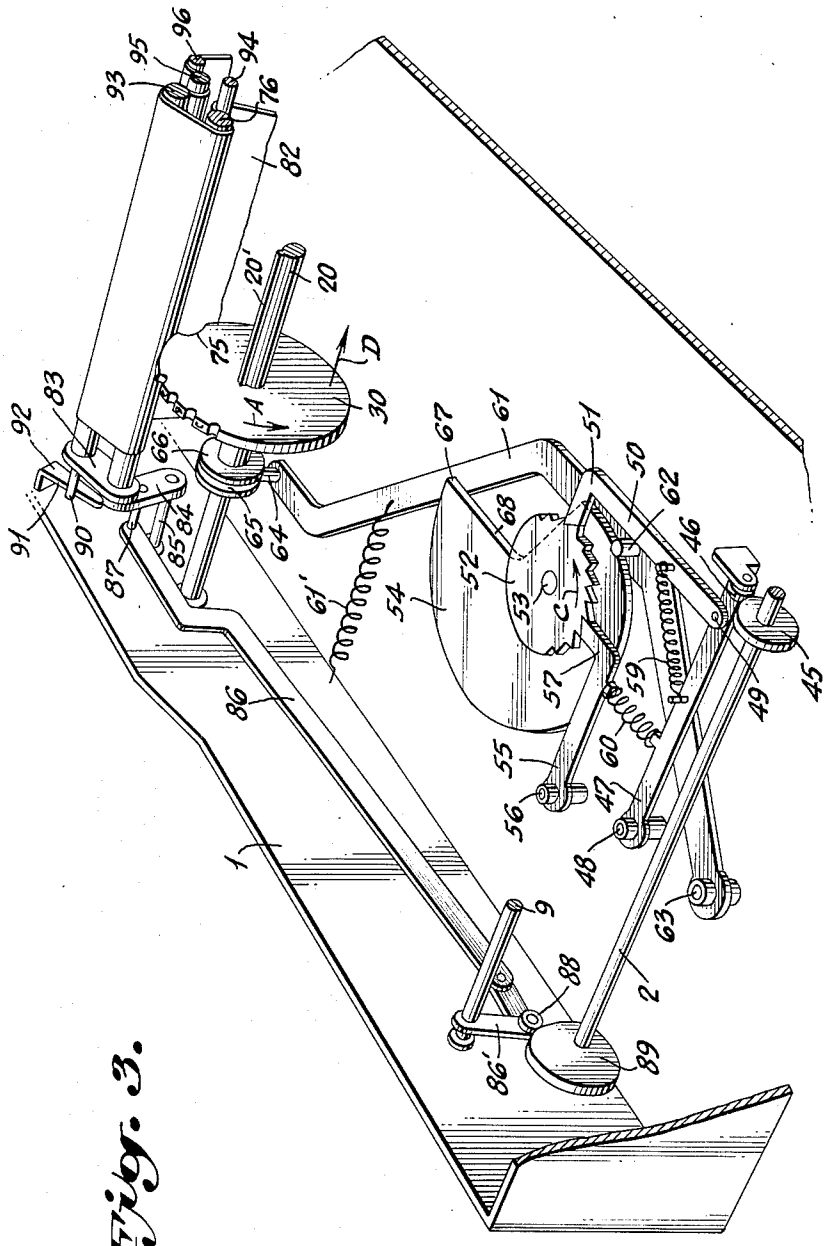

Fig. 3.

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TYPEWRITER COMPRISING IMPROVED KEYBOARD AND ASSOCIATED PRINTING MEANS

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Fig. 10.

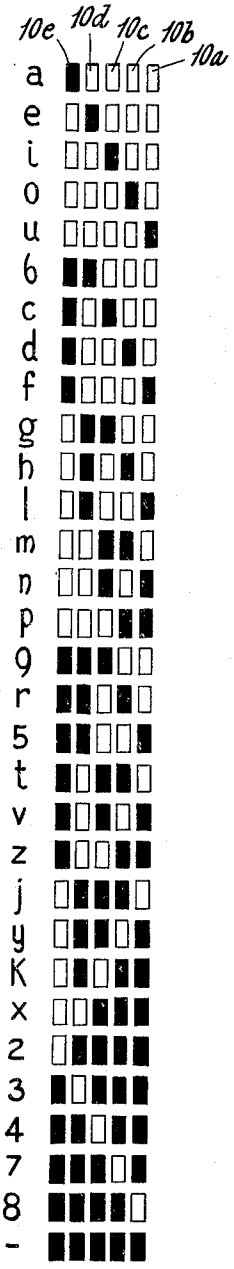

Fig. 7.

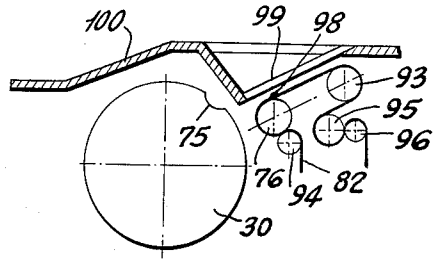

Fig. 6.

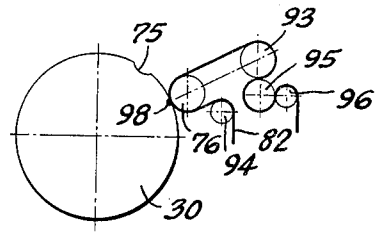

Fig. 5.

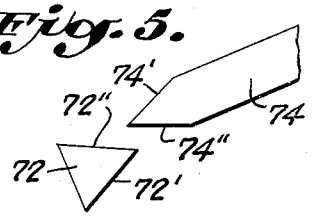

Fig. 4.

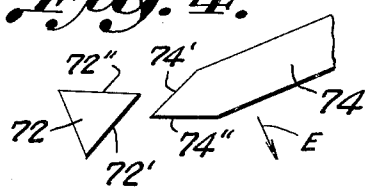

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Fig. 9.

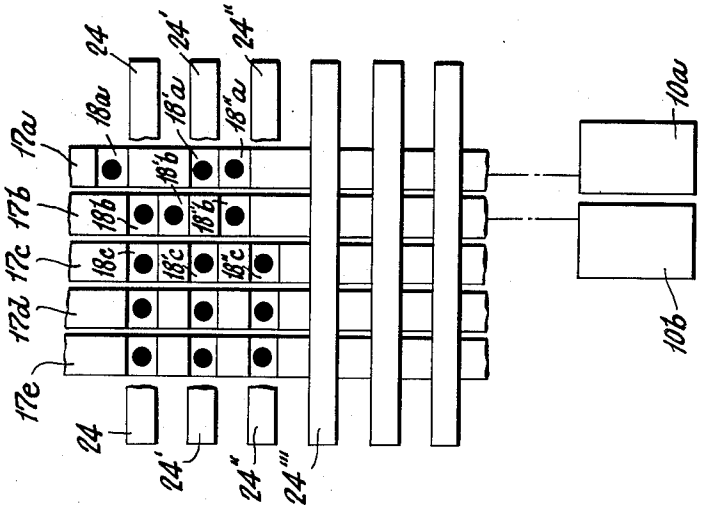
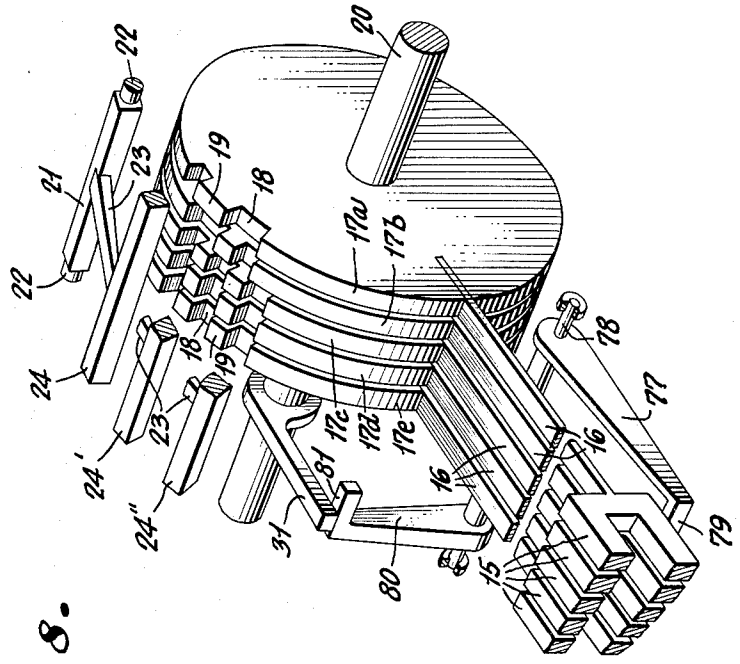


Fig. 8.



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United States Patent Office

3,215,246

Patented Nov. 2, 1965

3,215,246

TYPEWRITER COMPRISING IMPROVED KEYBOARD AND ASSOCIATED PRINTING MEANS

Nino Zanaboni, via Ariberto 24, Milan, Italy

Filed Dec. 10, 1962, Ser. No. 243,441
Claims priority, application Italy, Dec. 12, 1961, 22,529/61, Patent 686,708
11 Claims. (Cl. 197—11)

The present invention relates to a typewriting machine and more particularly to one which is lightweight and a portable typewriter.

It is an object of the present invention to provide a typewriting machine having a keyboard comprising a smaller number of keys than the symbols printed by depressing or operating the keys.

It is another object of the present invention to provide a lightweight typewriter having a minimum number of keys for printing a maximum number of symbols or indicia on printed paper so that the typewriter may be operated by one hand of the operator.

It is another object of the present invention to provide a light portable typewriter that does not require visual control and a typing system easy to learn which can be used in any condition whatsoever, as when a person is travelling in an air flight, in a train or car, when walking, reclining in an arm chair or lying in bed, etc. It can also be used in darkness.

It is another object of the present invention to provide a portable typewriter having finger keys that can be operated singly or in any combination with each other so that the operation of a single key or the operation of various combinations of keys will actuate selector means and stopping means and a symbol component means so that a different symbol will be moved into a predetermined position for printing upon a roll of paper for each different key or combination of keys pressed.

It is another object of the present invention to provide a portable typewriter in which the number of keys provided are smaller than the number of symbols that can be typed or printed with the machine, with a plurality of selector disk means and stopping means so that the symbol to be printed is first selected and thereafter a symbol component means is displaced angularly on a predetermined position to enable the printing of the symbol selected.

It is another object of the present invention to provide a portable typewriter machine having a symbol component means that can be rotated or spaced a predetermined distance and axially moved a predetermined distance so that different symbols may be printed on paper by use of a single symbol component member.

It is another object of the present invention to provide a typewriter having finger keys of less number than the symbols carried by a single symbol holder component movable with respect to a roll of paper on which the symbols are printed and which symbol holder component is connected to selector components each of which is timed with respect to the others so that operation of one or more of the keys singly or simultaneously determines the arrangement of the selector components with respect to each other and thereby controls a stopping component means

which determines the rotational position of the symbol holder component with respect to the paper roll which is then pressed against the symbol holder component.

It is another object of the present invention to provide a typewriting machine having 5 finger keys thereon so that 31 different signs, indicia or symbols can be printed depending upon the operation of the keys, either separately or simultaneously, and in which different possible combinations of keys can be operated, such as 5 different symbols being printed through the single operation of one finger key at a time; 10 symbols through the operation of 2 keys, or 10 symbols through the operation of 3 keys or 5 symbols through the operation of 4 keys at the same time, and one symbol through the operation of 5 keys simultaneously.

Various other objects and advantages of the present invention will be readily apparent from the following detailed description when considered in connection with the accompanying drawings forming a part thereof and in which:

FIGURE 1 is a perspective view of the typewriting machine;

FIGURE 2 represents the mechanism serving to rotate or position angularly the symbol-holder component;

FIGURE 3 represents the mechanism serving to axially slide or position axially the symbol-holder component;

FIGURES 4 and 5 illustrate diagrammatically particulars connected with the finger-keys;

FIGURES 6 and 7 represent the two positions of the rollers on which the paper is wound up in respect of the symbol-holder disc;

FIGURE 8 represents in particular the shaped discs with the small hammer placed in the stopping position upon the slight pressure on any of the finger-keys;

FIGURE 9 is the plane development of a part of the shaped discs; and

FIGURE 10 represents schematically the correspondence between pressed finger-keys and symbols imprinted on the paper.

Referring to FIGURE 2 the casing **1** of the type-writing machine of the present invention, is provided with a pivoting shaft **2** journalled thereto on which is rotatably mounted an idler gearwheel **3** rotated or driven by any well known driving means, as for example an electric motor, not shown. A pulley **4** fixed to shaft **2** adjacent gear wheel **3** is rotatably driven by gearwheel **3** by means of a clutch of a conventional type only shown partially in FIGURE 2. FIGURE 2 illustrates a stud member or bar **5** which can move into a groove **6** disposed in pulley **4** in such a manner that when bar **5** abuts rod means or stopping means **7** it is held back thereby and the clutch is disconnected so that the rotation of gearwheel **3** is not transmitted to pulley **4** and shaft **2** to rotate shaft **2**. When stud **5** is not held by the stopping means because it is in a raised position, gearwheel **3** and pulley **4** rotate jointly. The stopping means **7** includes a rod having two arms **8** which in turn are pivotally disposed on a shaft **9** fixed to casing **1**.

The machine is provided with finger-keys **10***a*, **10***b*, **10***c*, **10***d*, **10***e* having levers **11** pivotally disposed on fixed shaft **9** and provided at their outer ends with projections or protrusions **12** placed under rod **7**. Therefore, when

any of the finger-keys is pressed downwardly, rod 7 is lifted, thus causing the rotation of shaft 2 since bar 5 clears rod 7 in its raised position. Each finger-key returns to its initial position by means of spring members which are not shown in the figure, once the manoeuvre ceases, and therefore rod 7 resumes its lowered position. Thus stud 5 interferes with rod 7 to disconnect the clutch and stop rotation of shaft 2, while the driving means continuously rotates gearwheel 3. This cycle is repeated each time a finger-key is pressed and released.

In case one or more keys are pressed before stud 5 is in the position where it would interfere with rod 7, the said rod 7 being lifted, there would be a second rotation of shaft 2.

Each lever 11 is provided at its inner end or other end with a small elastic wire steel rod 13, provided with a small roller 14 on the end engaged in the U shape fork 15 of a lever 16. For clarity in the illustration shown in FIGURE 2 only one key 10*a* has been connected with the lever-members described above, although all that has been described applies equally as well for the other keys shown in the figure. Therefore as there are five keys, their number having been chosen as a mere example, there will be as many projections or protrusions 12 suitable for moving rod 7 and as many fork levers 16 side by side as there are keys.

Levers 16 are connected respectively with keys 10*a*, 10*b*, 10*c*, 10*d*, 10*e* and have their other ends fitted in discs or selecting members 17*a*, 17*b*, 17*c*, 17*d*, 17*e* having a cylindrical contour formed of a succession of alternating notches 18 and protrusions 19 in the peripheral circumference thereof. Further on, in the description, the reference numbers 18 will be marked by indices and letters so as to indicate the different notches of each single disc. The discs 17 are idly mounted on a shaft 20 journalled or pivotally connected to casing 1 of the machine. Thus when pressing on a key the respective disc connected therewith is displaced a certain angular distance or rotation about shaft 20. Disposed completely around the circumferential edges of the discs, and at a certain distance from them, are supports 21 fulcrumed by pivot member 22 fixed to casing 1 or to a part of the machine. Supports 21 are provided with elongated arms 23 which are in turn connected to small hammers 24, 24', 24'' etc. which can move in a radial direction away from the axis of a gearwheel 25. Springs constantly urge the hammers toward the gearwheel 25. Gearwheel 25 is disposed for oscillation around shaft 20 on which it is idly mounted. This movement of 25 is transmitted by a cam 26 keyed on shaft 2 in contact with a roller 27, fitted to one end of a lever 28, which pivots around the fixed shaft 9. The other end of lever 28 is pivotally connected by pivot pin 29 on gearwheel 25 and pivots, eccentrically with respect to the centre line or axis. The wheel 25 is thus submitted to angular oscillations in order that each one of its teeth 25' moves a corresponding small hammer 24, 24', 24'' etc. in contact with the wheel radially outwardly. Notches 18 and projections or protrusions 19 of the various discs 17*a*, 17*b*, 17*c* etc. are disposed in a manner so that with any pressing or manoeuvre of the keys downwardly either singularly, or simultaneously with any combination of keys, there is only one corresponding position and one corresponding angular movement of the disc or discs connected to the key or keys pressed, on the whole circumference of the discs 17 in which notches 18 are lined up, to form a continuous groove. Therefore, of all hammers 24, 24', 24'' which are free to move toward the centre during the second part of the oscillation of the wheel 25, only one hammer enters the continuous groove formed by the lined up notches 18 of discs 17*a*, 17*b*, etc. while all the other hammers will be prevented from doing so since they will be stopped in their descending movement by one or more of the protrusions 19 which are lined up parallel to the rotational axis of the discs.

On the same shaft 20 is a key or protrusion 20' on which a disc 30 is slidably disposed axially of shaft 20 and which disc 30 carries at convenient distances on its cylindrical surface the symbols (letters, numbers, etc.) which are to be impressed on the paper.

On shaft 20 lever or stop member 31 is fixedly connected. The number of hammers 24, 24', 24'' etc. and the number of teeth 25' provided are equal to the number of symbols borne by disc 30 and the number of hammers and teeth is equal to the number of finger-keys provided plus the number of possible combinations of finger-keys that can press simultaneously. The lever 31 is of such a length that when the lever rotates with shaft 20, it will not interfere with the small hammers disposed in a position radially away from the centre, but will interfere only with the particular hammer lowered and disposed in the lined-up notches 18. Therefore, for each single hammer 24, 24' etc. there is a corresponding symbol on disc 30, which corresponds to lever 31 stopping against the respective corresponding hammer and to disc 30 stopping in a pre-determined angular position.

The means which cause rotation of disc 30 and lever 31, are a cam 32 fitted or fixed to shaft 2, in contact with a roller 33 fixed to one end of a lever 34 fulcrumed to the fixed shaft 9 and provided at the other end with gear sector or member 35. The sector 35 meshes with a pinion 36 idly mounted on shaft 20 and secured to shaft 20 by means of unidirectional connection 37, partially shown in FIGURE 2 and being of a conventional type. During its own oscillation, gear sector 35 transmits motion to shaft 20 and then to disc 30, in the direction of the arrow A, during its downward movement as shown by arrow B, while when oscillating in the opposite direction it transmits no motion to disc 30.

Another cam 38 fixed to shaft 2 and conveniently timed with respect to cam 32 is in contact with roller 39 on one end of a lever 40 idly fulcrumed on fixed shaft 9 and having its other end provided with a bent member or stop clamp 41. On shaft 20 and in correspondence to clamp 41 is keyed a wheel 42 provided with a number of teeth equal to that of wheel 25. The lever 40 during a complete revolution of shaft 2, makes one oscillation and thus its bent part 41 frees and stops one tooth of wheel 42. Spring 43 fitted at one end to lever 34 and at the other end to casing 1 pulls downwardly in the direction of arrow B, sector 35 which is moved upwardly by the rotation of cam 32. Similarly spring 44 secured at one end to lever 40 and at the other end to casing 1 draws downwardly clamp 41 which moves upwardly during the rotation of cam 38. Therefore, as described above, the rotation of shaft 20 and thus of symbol-holder disc 30 is caused by the action of spring 43, and this rotation is made possible when clamp 41 is not engaged in any of the teeth of wheel 42.

FIGURE 9 shows the projection on a plane surface of part of discs 17*a*, 17*b* etc. where, for the sake of clarity, notches 18 are represented by a small rectangle with a dot, while protrusions 19 are simply marked by a rectangle. By means of this schematic illustration it is easier to understand how the machine members described up to now are operating. By pressing on finger-key 10*a*, if we assume that the different discs are in their own positions as shown in FIGURE 9, shaft 7 raises, shaft 2 starts rotating and consequently to an oscillation of wheel 25 around shaft 20 corresponds a rotation downwards of a certain angle of lever 16 jointly with disc 17*a* in a manner such that the notch 18*a* of disc 17*a* goes side by side with notches 18*b*, 18*c*, of discs 17*b*, 17*c* already lined up. The first part of the oscillation of wheel 25 causes all the small hammers 24, 24' 24'' etc. to rise while the return to the initial position allows these to lower on the wheel 25 and allows only one, in this instance, hammer 24, to set into the groove formed from notches 18*a*, 18*b*, 18*c* set side by side.

Simultaneously to the said movements. shaft 20 and

therefore disc **30** moves a certain predetermined angle in the direction of arrow A, in FIGURE 2 consequently to clamp **41** rising and to the lowering according to arrow B of the gear sector **35**.

This rotation of disc **30** stops as soon as lever **31** turning jointly with the said disc strikes against the only hammer **24** which was lowered within the continuous groove **18***a*, **18***b*, **18***c* etc. formed by the aligned discs **17***a*, **17***b* etc. Immediately thereafter, clamp **41** lowers on wheel **42**, inserting itself between two contiguous teeth or discs of wheel **42**, thus determining the stopping of the wheel **42** and the exact angular positioning of the symbol-holder disc **30**.

Such an operating cycle takes place during a full rotation of shaft **2**, by fully pressing on key **10***a* and releasing it prior to stud **5** or stop member arriving in contact or abutting correspondence with bar **7**. Furthermore, cam **32** is timed in respect to stud **5**, in such a way so that in completing a full rotation, sector **35** has been brought to its highest position, and is ready to carry out in the next cycle the active descent stage called for by spring **43**.

It is easily understood that the stopping of the active descent motion of sector **35** and therefore the stopping of disc **30** is caused by lever **31** interfering with and abutting against the single lowered hammer **24** within the aligned grooves of the discs or wheels **17***a*, **17***b* set side by side. The combination between the hammers and their respective notches must have a certain play in such a way that friction should be reduced to a minimum, so that such a manouvre or operation be smooth and safe. On the other hand, however, angular positioning of disc **30** must be absolutely precise, because as it will easily be found further on, from this positioning depends the correct lining-up of the symbols written on the paper. It is the exact positioning of clamp **41** which inserts itself between two teeth on wheel **42** which teeth are timed correctly with respect to the symbols of disc **30**, that determines a slight angular displacement of the disc in the direction opposite to that of arrow A, with the consequent right positioning of same. The same small angular displacement is transmitted also to lever **31** by backing off or going slightly away from the small hammer against which it stopped an instant before. The advantage of this is that friction in the raising movement of the small hammer in respect to lever **31** is eliminated.

Let us now suppose that we press on key **10***b*, leaving key **10***a* free to return to its resting position. With the rotation of shaft **2**, hammer **24** is lifted from the groove formed of notches **18***a*, **18***b*, etc. and therefore disc **17***a* effects a similar rotation, but in a direction opposite to the preceding one, caused by pressure on key **10***a*. This rotation is due to the elastic component or rod **13** which bent out of or got out of shape previously when key **24** remained in notch **18***a*, lined up with notches **18***b*, **18***c*, while lever **16** keyed to disc **17***b* turned downward a certain angle corresponding to similar displacement of notch **18'***b* which comes beside notches **18'***a*, **18'***c* already lined up. Therefore, to the pressure of key **10***b* and to the consequent oscillation of wheel **25** corresponds the rising of hammer **24** and the lowering of hammer **24'** into the continued groove formed of the notches **18'***a* and **18'***b*, **18'***c* set side by side. Simultaneously to the rising of hammer **24** and of clamp **41** of the gear wheel **42**, lowering of gear sector **35** is obtained, this being determined by the return of spring **43**, and therefore there is a rotation of disc **30**, limited by the interference of lever **31** against the only lowered hammer **24'** which stops said rotation. At the end of the full revolution of shaft **2**, clamp **41** sets in again between two contiguous teeth of wheel **42**, thus causing the exact angular position of the symbol-holder disc **30**, corresponding to the pressure of finger-key **10***b*.

In the meantime sector **35** resumed its highest position, being thus ready to move or return downwardly at the start of next cycle.

Let us now suppose we press at the same time both keys **10***a* and **10***b*, starting from the previous position, corresponding to the position of small hammer **24'** in the groove formed of lined up notches **18'***a*, **18'***b*, **18'***c* etc. and to the lining up of notches **18''***b*, **18''***c* etc. Therefore when we press keys **10***a*, and **10***b* at the same time, it results in notch **18''***a* lining up with notch **18''***b* while notch **18''***c* is not subject to any displacement, because elastic component **13**, previously put out of shape by pressing on key **10***b*, is now discharged just by lowering the said key **10***b*. Consequently, by lowering at the same time keys **10***a* and **10***b*, the result is that notches **18''***a*, **18''***b*, **18''***c* are all lined up, and the small hammer **24''** is set into the continuous groove formed by these notches and consequently stops lever **31** which interferes against it with a consequent angular positioning of disc **30**. Similarly with the operation of any of the single keys, and the operation of more keys at the same time, according to the number of possible combinations of them, there is a corresponding definite angular positioning of disc **30** and one of the symbols on it.

Referring to FIGURE 3, the disc **30** is axially moved or slid along the axis of shaft **20** as hereinafter described. On shaft **2** is a fixed cam **45** in contact with a small roller **46** carried on one end of a rod or bar **47** fixed at the other end to a pivot member **48** secured to the base of the casing **1**. Rod **47** is pivotally connected by a pivot pin **49** to a lever **50** which has a bent end **51**. A gearwheel **52** rotatably secured by means of small shafts **53** onto the base of casing **1** and moves jointly with cam **54** to which it is secured. Another lever **55** is fulcrumed by means of pivot pin **56** to the casing **1** and has a bent end **57**. Both bent parts **51** and **57** are of such a shape as to set in between and engage the teeth of wheel **52** and therefore during every oscillation of rods **47** and **50** due to rotation of cam **45**, the bent end **51** drags the wheel **52** in the direction of arrows C in FIGURE 3 for one stroke, while during return of lever **50** the wheel remains clamped in position, this being due to the fact that the other bent end **57** acts as a brake. Therefore during the oscillations of levers **47** and **50** there is a corresponding unidirectional release motion from cam **54**. Springs **59** and **60** well placed respectively between the pair of levers **47** and **50** and **47** and **55** ensure the contact between cam **45** and roller **46**, as well as between the bent parts **51** and **57** and wheel **52**.

The lever **61** provided with a stud or stop member **62** in contact with cam **54**, is fulcrumed at one end by means of pivot **63** to casing **1**. At the other end the lever **61** is provided with pin **64** inserted in groove **65** of pulley **66** which is fixed on shaft **20** and turns jointly with disc **30**. Cam **54** has such a profile that for revolution of shaft **2** and therefore for each stroke of the cam **54** in the direction of arrow C, lever **61** and consequently disc **30** move one predetermined space, interval or constant stroke along shaft **20** in the direction of arrow D.

When disc **30** arrives at the stop end corresponding to the position of stud **62** in contact with edge **67** of cam **54**, stud **62** runs rapidly along side **68** of cam **54** by means of spring **61'**, and therefore lever **61** returns rapidly in the direction opposite to that of arrow D, with the consequent displacement of the said disc **30** in the left-hand position as when starting to write. Therefore to a complete revoluton of cam **54** corresponds a full axial release movement of disc **30** in the direction of arrow D, and a rapid movement in the direction opposite to that of arrow D.

On shaft **2** is keyed cam **69** in contact with a small roller **70** (FIGURE 2) carried by a lever rectifier element **71** (FIGURE 2) fulcrumed to shaft **9** and fixed at one end to elongated prism **72**. The other end of lever **71** is connected to spring **73** fixed to casing **1** and which maintains the contact between cam **69** and roller **70**.

Each fork **15** is part of a corresponding bar **74** ending by an edge formed of two diagonally inclined faces **74'** and **74''** which come rapidly into contact with faces **72'** and **72''** of prism **72** in the manner described hereunder (see FIGURES 4 and 5. When the operator presses one finger-key or the finger-keys in an irregular way, that is, not the full way down or too rapidly, prism **72** intervenes, by operating on bar or bars **74** corresponding to the finger-keys or the finger-key pressed, and shifting the bar or bars firmly in the lowered position, or back into the resting position. In fact, in order that a small hammer will penetrate into a groove formed of discs **17***a*, **17***b* etc. it is necessary that each fork **15** and consequently each disc should have a well determined position which is obtained as stated above, by positioning bars **74** up or down, during a cycle of the machine, or duing a revolution of shaft **2**. Without this useful arrangement the symbol-holder disc **30** would not acquire an established angular position during the machine cycle. Therefore when the finger-keys are not properly pressed, and all the way down, but in such a way that face **74'**, as shown in FIGURE 4 corresponding to the keys, goes below prism **72**, during the active motion of said prism caused by spring **73**, face **72'** presses against face **74'** in a manner to decidedly lower bar **74** in the direction of arrow E, and accomplishes what the operator by mistake did not do.

Referring to FIGURE 5, when face **74''** instead does not go under prism **72**, face **72''** of the prism presses during its active motion, against face **74''** lifting bar **74** upwardly and in the direction opposite to that indicated by arrow E. With an incomplete, thus very small, pressure of each finger-key the operator causes the uplifting of bar **7** and consequent rotation of shaft **2** corresponding to a cycle of the machine, and then with a very slight pressure on any other finger-key, face **72''** causes all bars **74** to raise, even those previously lowered due to pressure on the corresponding keys.

This uplifting of the bars is rendered practicable by the oscillation of wheel **25** and therefore by the uplifting of all the small hammers. Therefore, in the cycle determined by a slight pressure of any key or of several ones in such a manner that bars **74** are pushed upwards by face **72''** of prism **72**, a determined hammer enters into a groove formed by the notches of discs **17***a*, **17***b* etc. which are set side by side. This causes an angular positioning of disc **30**.

As will be described hereinafter, immediately after the proper angular and axial positioning of symbol-holder disc **30**, a specially inked, roller **76** on which is conveniently wound the paper tangentially approaches disc **30** which presses against it in such a way that the symbol brought by the disc into correspondence or contact with roller **76** as shown in FIGURE 6 is reproduced on the paper.

The arrangement of the symbols on disc **30** can be selected in a manner such that the symbol corresponding to a voluntary slight pressure of any finger-key with the consequent uplifting of bar **74** by means of prism **72**, can be one of the letters more commonly used in writing.

In writing, since the spacing between one word and the next one is very frequent the disc **30** can present a notch **75**, as shown in FIGURE 7 instead of a raised symbol in the tangential position adjacent roller **76** which can correspond to an intentional slight pressure applied to the keys as described above, so such notch would serve to create the proper spacing between the written words.

On casing **1** are fixed two parallel studs **1'** as shown in FIGURE 2, between which are disposed all the bars **74**. When pressing the keys, these bars, by the interposition of elastic rods **13** have a limited shifting distance or space due to the interference with studs **1'**. This is necessary to make discs **17***a*, **17***b* provide constant angular shiftings in a way that at every operation of the keys

there will always be a hammer **24**, **24'**, **24''** etc. which enters into a groove formed by the notches of the discs which are set side by side. The amplitude of the angular oscillation of prism **72** is such that the bars eventually lowered or uplifted by the prism are made to rest against studs **1'**.

As a mere example and without this limiting the extent of the invention the number of keys selected is five. The possible number of combinations of the five keys, two by two, three by three, four by four, and of the five at the same time is twenty-six. Therefore with five finger-keys, the number of symbols marked on disc **30** including also notch **75** is thirty-two, which is equal to the total number of finger-keys, added to the number of possible combinations mentioned above, plus one, which corresponds to the slight pressure on any key so as to execute one cycle without having practically any angular shifting of discs **17***a*, **17***b* etc. Therefore even the number of hammers **24**, **24'** etc. around discs **17***a*, **17***b* etc. is thirty-two.

In the practical realization of what is described above and given only as an example, the movement of discs **17***a*, **17***b*, **17***c* etc. around shaft **20** is carried out by means of the levers **16**, extending into the discs. Because of these levers **16**, the hammers **24** placed immediately on both sides of a lever **16**, must be spaced angularly in such a manner that during angular shifting of the levers **16**, they will not interfere with the two hammers adjacent a lever **16** are therefore spaced by larger angle apart than that existing between the other hammers. Since there are as many hammers as symbols carried by disc **30**, and the hammers are spaced the same angle apart as the symbols, on the same disc **30** there will be a part of the circumference without symbols subtended by the same angle corresponding to the two hammers placed at opposite sides of levers **16**. Since in our case the hammers and therefore the symbols are thirty-two, consequently the intermediate angle mentioned above is less than $\frac{1}{32}$ of a revolution.

If the movement of discs **17***a*, **17***b*, **17***c* etc. instead of being controlled by levers **16** placed radially, was controlled by means or members not shown in the figures, and operating in the axial direction, that is parallel to shaft **20**, the thirty-two hammers **25**, **25'**, **25''** etc. could be placed all around the discs themselves, and angularly, at an equal distance one from the other, without any discontinuity in spacing between them. Similarly, the symbols marked on disc **30** in a number equal to that of the hammers, would be spaced by equal angles between them and by those existing between each hammer. This angle would be equal to $\frac{1}{32}$ of a revolution.

Another embodiment or equivalent solution as shown in FIGURE 8, is applied in the case in which discs **17***a*, **17***b* etc. would be moved by the radial levers **16**. In that case the hammers **24**, **24'** etc. ready to enter into the grooves formed of notches of discs **17***a*, **17***b* etc. are as many as the symbols of disc **30**, less one. This solution is materialized by lever **77** fulcrumed to casing **1** by means of a stud **78**, one end of which terminates the bent part **79** placed under forks **15** while at its other end is fitted lever **80** which has on its end in turn a hammer **81** which can interfere with lever **31**. On lever **77** operates a spring (not shown in the figure) which tends to push the levers upwardly. Therefore when one or more keys are slightly pressed at the same time and in a manner such that prism **72** lifts bars **74**, lever **77** pressed by the spring follows the upward movement of bars **74** and consequently of forks **15** turning around pivot **78**.

The hammer **81** is thus in such a position as to interfere with lever **31** against which it stops; in fact by this operation, discs **17***a*, **17***b* etc. are not shifted by the finger-keys but only those positioned by the preceding operation return by means of the elastic rods **13** and they are therefore in their single relative position corresponding to the interference of hammer **81** of lever **31**.

To this position of lever **31** may correspond for example the condition for which notch **75** of disc **30** is in contact with the paper roller **76**, and in this case with this operation, a spacing would be executed. Therefore hammer **81** is in such a position as to interfere with lever **31** only when all the forks **15** are in the raised position. In this position of forks **15** of discs **17** there exists no continuous groove formed by notches set side by side. Also in this case all the hammers **24**, **24'**, **24''**, etc. and **81** are equally spaced between them by a certain angle or space equal to that existing between the various symbols of disc **30**.

Roller **76** (FIGURES 6 and 7) on which is wound up paper **82** is fixed on lever **83** shown in FIGURE 1 and keyed to lever **84** (FIGURE 1), hinged to casing **1** by means of pivot pin **85**. Connecting rod **86** (FIGURE 1) is fixed at one end to pivot pin **87** which is fitted in turn to lever **84** and rod **86** is hinged at its other end to lever **86'** provided with a bearing roller **88** in contact with cam **89** keyed onto shaft **2**. Lever **86'** is pivoted on shaft **9** in a manner such that, operated by cam **89**, it oscillates around shaft **9** and transmits motion through the connecting rod **86** to lever **84** which thus oscillates around pivot **85**. A spring, not shown in the figure, causes the paper carrying roller **76** to approach symbol-holder disc **30** and thus the symbol writing, and consequently cam **89** brings the paper carrying roller back to the position away from the symbol-holder disc.

Lever **83** is operating jointly to pivot **90** resting on the inclined part **91** of support **92** fixed to casing **1**. To the same lever **76** is fiitted a second roller **93** on which is wound paper **82**. Under both rollers **76** and **93** are respectively the two rollers **94** and **95** connected to casing **1**. Paper **82** supplied for instance by a feeder (not shown in the figure) winds up around rollers **94**, **76**, **93** and **95**. Finally, roller **96**, pressed against roller **95** serves to guarantee the adherence of the paper against roller **95**. Cam **89** is timed with respect to the other members of the machine, so that as soon as symbol-holder disc **30** which is positioned both angularly and axially, causes lever **84** to oscillate around stud **85**, in shifting the said lever **84** towards disc **30**, the unit formed by rollers **76** and **93** participates in this movement, so that the paper approaches and presses against the disc, as illustrated in FIGURE 6.

In this position after disc **30** has been conveniently inked, on the paper **82** is printed the symbol marked **98** corresponding to that borne by the said disc. Afterwards, lever **84** is shifted in the opposite direction and thus rollers **76** and **93** are placed when oscillation is over, in the position of FIGURE 7. This position is assumed for the simultaneous movement of lever **83** around pivot **85** and along the inclined plane **91**. In the position of FIGURE 7 reached prior to the starting of a second cycle of the machine, symbol **98**, imprinted on the paper through the last operation of the keys, has been shifted with respect to roller **76**. Symbol **98** shifted in this manner, as shown in FIGURE 7, can be read through opening **99** of cover **100** which is adapted to casing **1** and encloses the whole type-writing machine.

With the said relative shifting between paper **82** and roller **76**, there is the advantage that the operator can control each symbol by and by as it is written, and opening **99** is largely sufficient to allow reading some lines of the signs previously typed.

During the following cycle, after positioning of disc **30**, roller **76** again approaches the latter and again causes the paper **82** to shift with respect to the said disc by the same distance as previously, as shown on FIGURE 6. It is, however, understood that disc **30** moves away along shaft **20** of one spacing from sign **98** previously typed, and thus a new sign is impressed next to sign **98**, after which, that described above is again repeated. After every line thus written, while stud **62** moves along wall **68**, there is a corresponding rapid return of disc **30** in the direction opposite to that indicated by arrow C.

At this point before the new cycle starts, roller **95** revolves, by means not described herein, a certain angle, so that a corresponding quantity of paper is caused to be fed outwardly or come forward, an equal distance between the typed lines. Corresponding to the keys **10*a***, **10*b***, etc., the cover shows an opening **101** thereas to make it possible to use the keys with the fingers. Since the fingers of one hand only are preferably used, cover **100** shows next to opening **101**, two imprints **102** on which the thumb of either the right or left hand can easily rest.

Further, each key, as shown in the figures, has a certain special position so as to suit both the natural shape of the hand and the different length of the fingers; in fact the keys are set side by side in such a way that the centres of the surface of each one of them are on a bent line and are placed, with respect to a horizontal plane, at different heights with the central ones deeper than the lateral ones. It is thus easy to recognize each single key only by touching it, without having to check by sight, and this allows the operator to place the hand correctly.

In FIGURE 10 are shown the symbols (letters, numbers, etc.) marked on disc **30** and, in correspondence with these, keys **10*a***, **10*b***, etc., the dark ones represent the pressed keys and the white ones the keys in stopping position. For example, in the type-writing machine of the invention, 25 letters, five numbers and one dash (—) are marked on disc **30**. As it has been described above, all these symbols are typewritten by pressing each key down all the way either singly or according to combinations, two by two, three by three, four by four and five at the same time, as shown in FIGURE 10. The spacing sign, as it has been described above, is obtained by pressing very slightly any key, by itself, or more than one at the same time. The graph of letters o, b, l, q, s has been selected in such a way that these could be used also to typewrite respectively numbers 0, 6, 1, 9, 5. This useful arrangement has been adopted to reduce the number of symbols on disc **30** and consequently the finger-keys to handle, without compromising a satisfactory clarity in type-writing.

Further modifications can be brought to the particulars of the invention without exceeding the limits of the said invention.

What is claimed is:

1. A type-writing machine comprising a movable symbol holder means comprising a disc with a plurality of symbols on it for printing an individual symbol on a paper, stopping means for stopping the symbol on the holder means to be printed on the paper at a predetermined position, selector component means for selecting the symbol to be printed, and key means comprising a plurality of finger keys for operating said selector means to select a predetermined symbol and for operating said stopping means to move the symbol holder means to a predetermined position, said stopping means including stopping elements, said holder means comprising a lever which abuts against said elements, rotation means comprising a cam and a gear sector, said cam causing the gear sector to turn in one direction, said sector being pulled in an opposite direction by a spring, a pinion which is geared with said sector being connected to said disc by a unidirectional clutch so as to transmit motion to said disc only when the pinion is driven by said spring.

2. A type-writing machine comprising a movable symbol holder means with a plurality of symbols on it for printing an individual symbol on a paper, stopping means for stopping the symbol on the holder means to be printed on the paper at a predetermined position, selector component means for selecting the symbol to be printed, and key means comprising a plurality of finger keys for operating said selector means to select a predetermined symbol and operating said stopping means to move the symbol

holder means to a predetermined position, said selector means comprising disc-shaped elements mounted idly on a shaft with alternating notches and projections on their circumferences disposed so that for operation of a single key and various combinations of keys there is only one series of notches of said disc elements that are in alignment to form a continuous groove, said stopping means including stopping elements engageable in said continuous grooves and said holder means comprising a lever which abuts against said stopping elements, a drive shaft rotated by operation of any of said keys, an oscillating member connected to said drive shaft and caused to oscillate by rotation of said drive shaft, said oscillating member being operatively connected to said stopping elements and adapted to disengage respective stopping elements from said continuous grooves when oscillated by said drive shaft, a gearwheel keyed onto said shaft which carries said disc elements, said gearwheel having as many teeth as the number of symbols on said symbol holder, a clamp operated by said drive shaft and engageable with the teeth on said gearwheel, said drive shaft actuating said clamp so as to disengage said clamp from said gearwheel simultaneously with disengagement of said stopping elements from said grooves.

3. The machine of claim 2, wherein said clamp is actuated to disengage said gearwheel by a cam keyed on said drive shaft, and said clamp is actuated to engage said gearwheel by action of a spring connected to said clamp.

4. A type-writing machine comprising a movable symbol holder means with a plurality of symbols on it for printing an individual symbol on a paper, stopping means for stopping the symbol on the holder means to be printed on the paper at a predetermined position, selector component means for selecting the symbol to be printed, and key means including a plurality of finger keys for operating said selector means to select a predetermined symbol and operating said stopping means to move the symbol holder means to a predetermined position, said selector means comprising disc-shaped elements mounted idly on a shaft with alternating notches and projections on their circumferences and disposed so that for operation of a single key or various combinations thereof, there is only one series of notches of said disc elements that are brought into alignment to form a continuous groove, said stopping means including stopping elements engagable in said continuous grooves, said holder means including a lever which abuts against said stopping elements and also comprising a disc fixed to said shaft, said disc comprising a number of symbols equal to the number of said stopping elements, said symbols being disposed at angles to each other which are equal to the angles between said stopping elements, a drive shaft rotated by operation of any of said keys, an oscillatory member connected to said drive shaft and caused to oscillate by rotation of said drive shaft, said oscillatory member being operatively connected to said stopping elements and adapted to disengage respective stopping elements from within said continuous grooves when oscillated by said drive shaft, a rectifier element driven by said drive shaft which, in reaction to an incomplete operation of a key, causes the disc elements to perform a complete angular movement corresponding to the operated key if said disc elements have at least been caused to move past a certain point by said incomplete operation of a key, said rectifier element causing the disc elements to return to their previous resting position if said disc elements have not been caused to move past said certain point by said incomplete operation of a key.

5. The machine of claim 4, wherein said rectifier element is driven by a cam keyed to said drive shaft and comprises a double-face prism, each face thereof being operatively associated with means which are associated with said disc elements and which cause movement of said disc elements.

6. A type-writing machine comprising a movable symbol holder disc with a plurality of symbols circumferentially disposed therein for printing an individual symbol on a paper, said disc being fixedly mounted on a disc holder shaft for rotation therewith, shopping means for stopping the symbol disc at a predetermined position to print a desired symbol on a paper, selector component means for selecting the symbol to be printed, and key means comprising a plurality of finger keys for operating said selector means to select a predetermined symbol and for operating said stopping means to permit movement of the symbol holder disc to a predetermined position, said selector means comprising disc-shaped elements mounted idly on said disc holder shaft with alternating notches and projections on their circumferences disposed so that for operation of any single key or various combinations of keys there is only one series of notches of said disc elements that are in alignment to form a continuous groove, said stopping means including stopping elements equal in number to said symbols and disposed about the circumference of said disc-shaped elements, the angular displacement between respective stopping elements being equal to the angular displacement between respective symbols in said symbol disc, said stopping elements being engageable in said continuous grooves, and said holder means comprising a lever which is fixed to said shaft and which is adapted to abut respective ones of said stopping elements, a drive shaft rotated by operation of any of said keys, an oscillating member connected to said drive shaft and caused to oscillate by rotation of said drive shaft, said oscillating member being operatively connected to said stopping elements and adapted, when oscillated by said drive shaft, to disengage respective stopping elements from said continuous grooves, said symbol disc being operatively connected to said drive shaft by rotation means so that for revolution of said drive shaft there is corresponding rotation of said symbol disc, rotation of said symbol disc being interrupted when said lever abuts against a one of said stopping elements, said rotation means comprising a cam and a gear sector, said cam causing the gear sector to turn in one direction, said sector being pulled in an opposite direction by a spring, a pinion which is geared with said sector being connected to said symbol disc by a uni-directional clutch so as to transmit motion to said symbol disc only when the pinion is driven by said spring.

7. The type-writing machine of claim 6, including a gearwheel keyed onto said disc holder shaft, said gearwheel having as many teeth as the number of symbols on said symbol disc, a clamp operated by said drive shaft and engageable with the teeth on said gearwheel when said lever is in abutting engagement with a one of said stopping elements, said drive shaft actuating said clamp so as to disengage said clamp from said gearwheel simultaneously with disengagement of said stopping elements from said grooves.

8. The machine of claim 7, wherein said clamp is actuated to disengage said gearwheel by a cam keyed on said drive shaft, and said clamp is actuated to engage said gearwheel by action of a spring connected to said clamp.

9. The machine of claim 7, wherein each finger key actuates a clutch which connects said drive shaft with a continuously revolving motor-driven wheel so that operation and release of any key causes said clutch to drive said drive shaft for at least one complete revolution of said drive shaft.

10. The machine of claim 9, including a rectifier element driven by said drive shaft which, in reaction to an incomplete operation of a key, causes the disc elements to perform a complete angular movement corresponding to the operated key if said disc elements have at least been caused to move past a certain point by said incomplete operation of a key, said rectifier element

causing the disc elements to return to their previous resting position if said disc elements have not been caused to move past said certain point by said incomplete operation of a key.

11. The machine of claim **10**, wherein said rectifier element is driven by a cam keyed to said drive shaft and comprises a double-face prism, each face thereof being operatively associated with means which are associated with said disc elements and which cause movement of said disc elements.

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