Feb. 23, 1943. A. COLOMBO 2,311,737

SILENT TYPEWRITING MACHINE

Filed Oct. 18, 1941 6 Sheets-Sheet 1

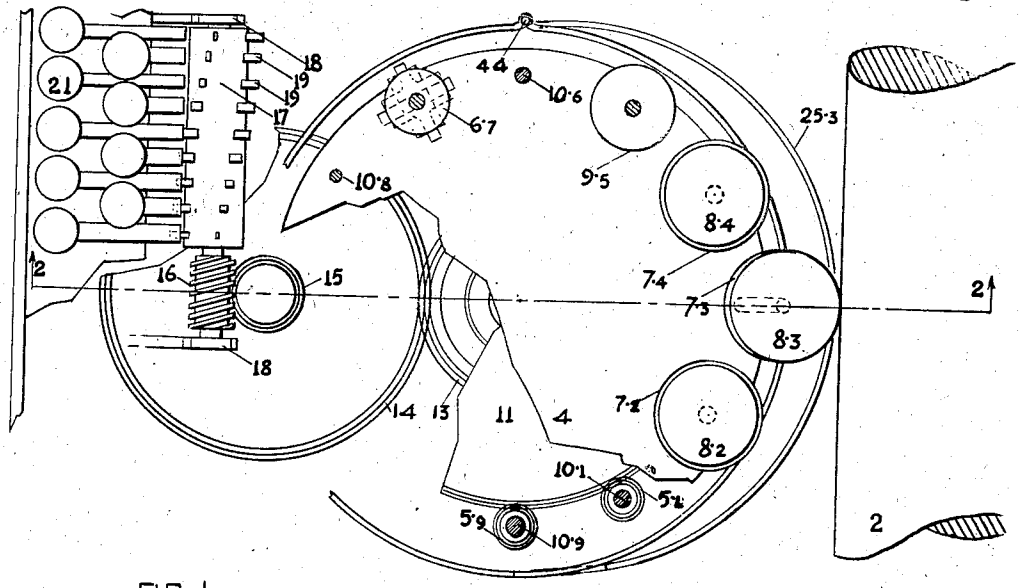


FIG. 1

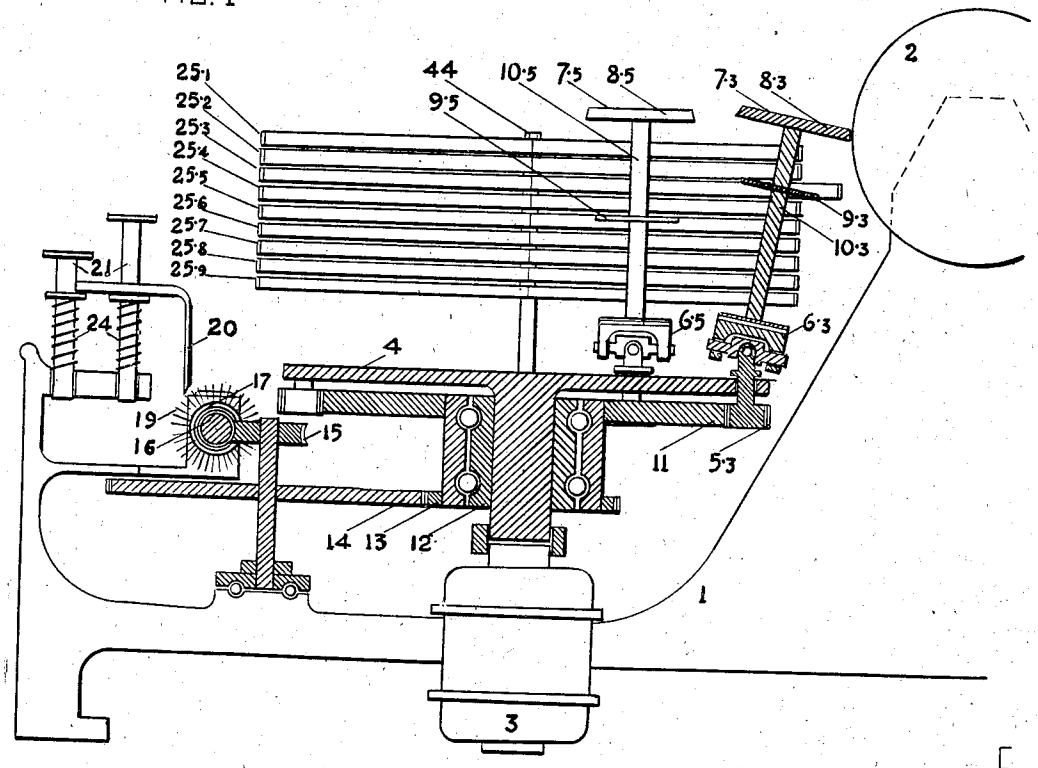


FIG. 2

ACHILLE COLOMBO
INVENTOR.

BY Edgar Luzzatto
AGENT

Feb. 23, 1943. A. COLOMBO 2,311,737

SILENT TYPEWRITING MACHINE

Filed Oct. 18, 1941 6 Sheets-Sheet 2

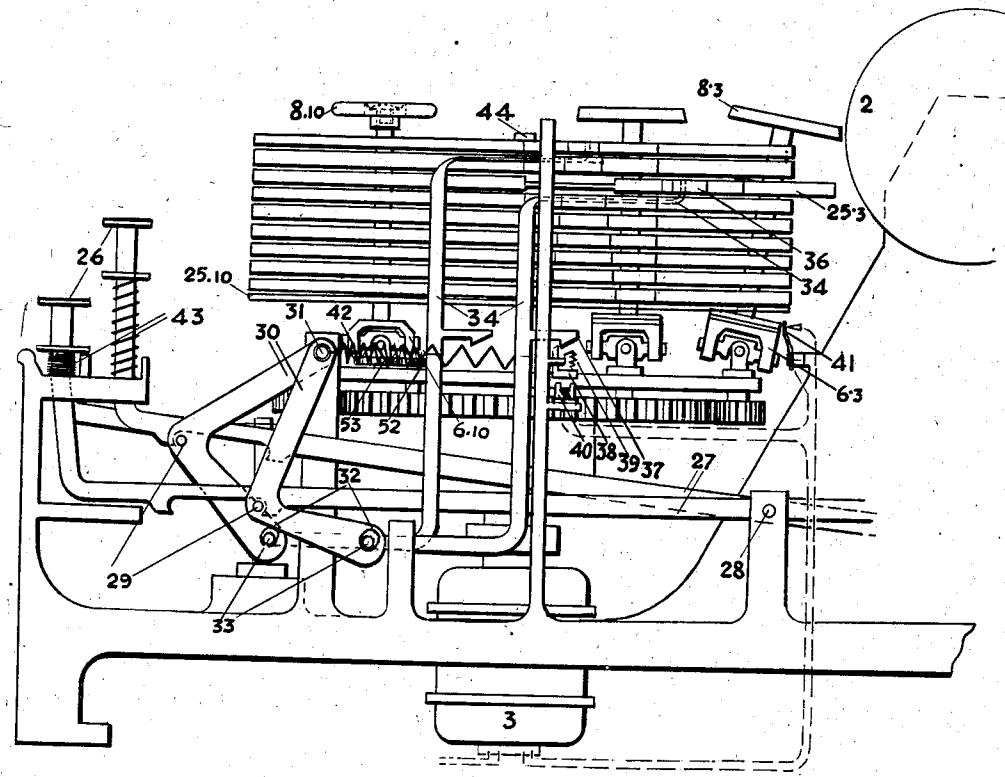


FIG. 3

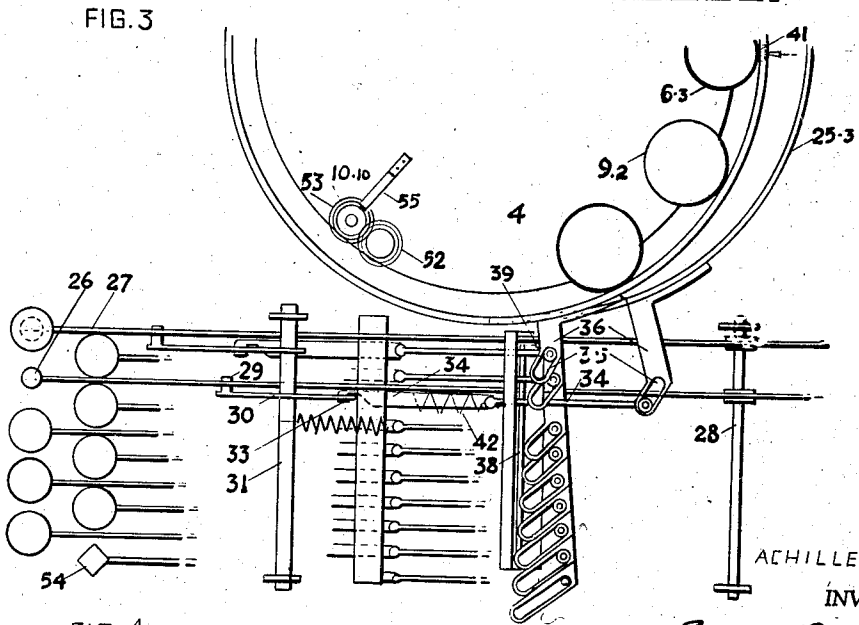


FIG. 4

ACHILLE COLOMBO
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Feb. 23, 1943. A. COLOMBO 2,311,737

SILENT TYPEWRITING MACHINE

Filed Oct. 18, 1941 6 Sheets-Sheet 3

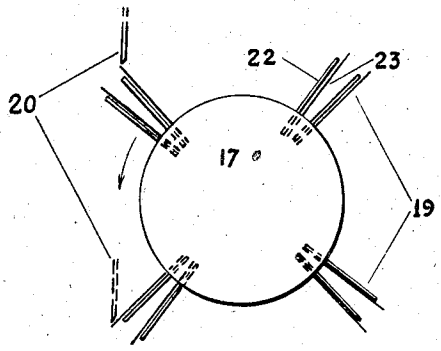


FIG. 5.

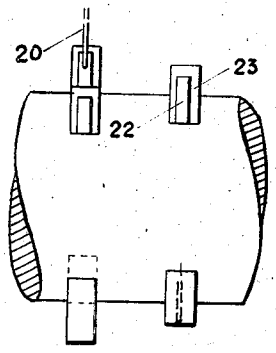


FIG. 5.A.

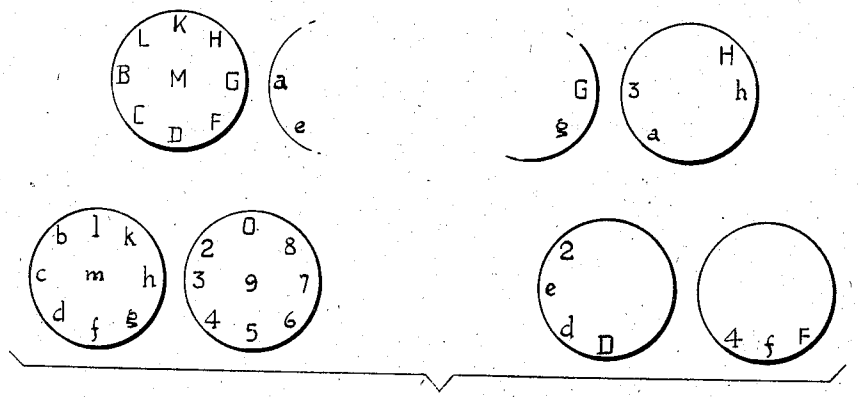


FIG. 6

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Feb. 23, 1943. A. COLOMBO 2,311,737

SILENT TYPEWRITING MACHINE

Filed Oct. 18, 1941 6 Sheets-Sheet 4

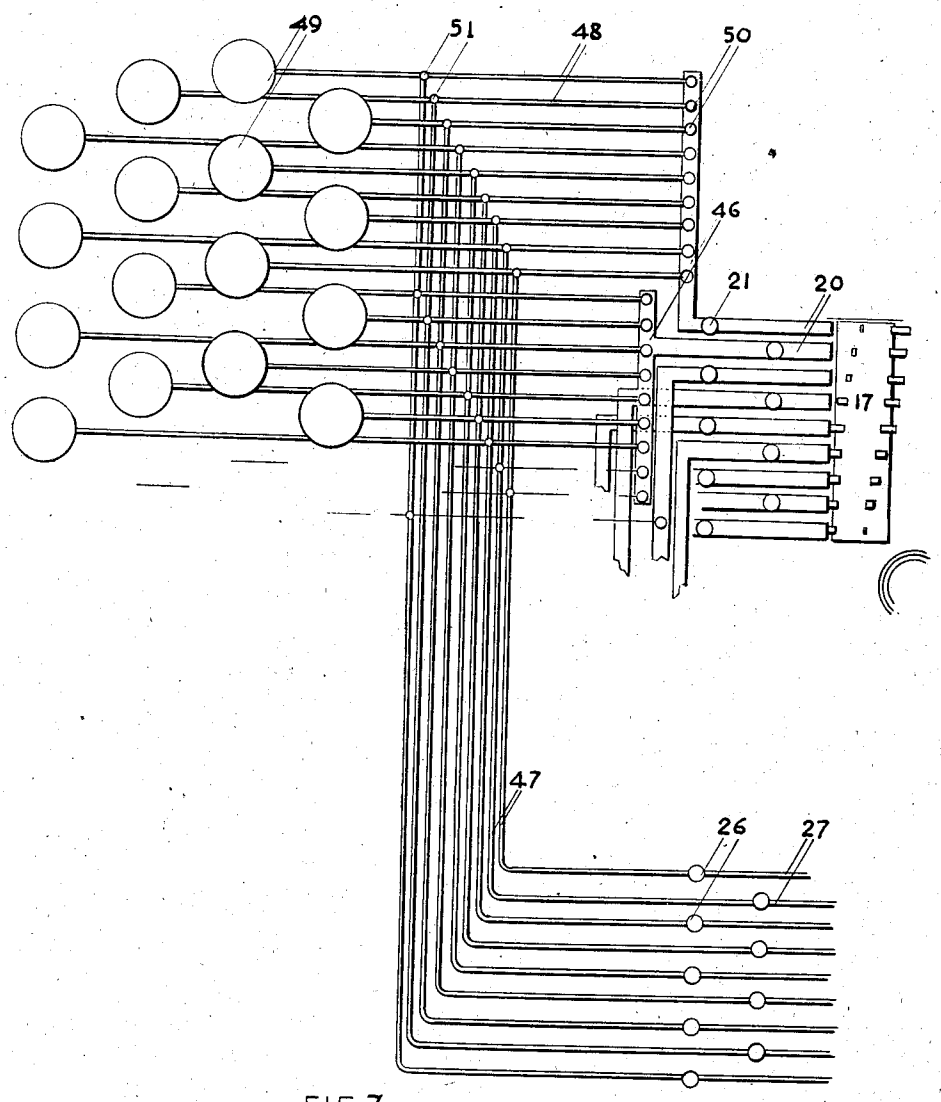


FIG. 7

ACHILLE COLOMBO
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BY Edgar Lucas Hay
AGENT.

Feb. 23, 1943. A. COLOMBO 2,311,737

SILENT TYPEWRITING MACHINE

Filed Oct. 18, 1941 6 Sheets-Sheet 5

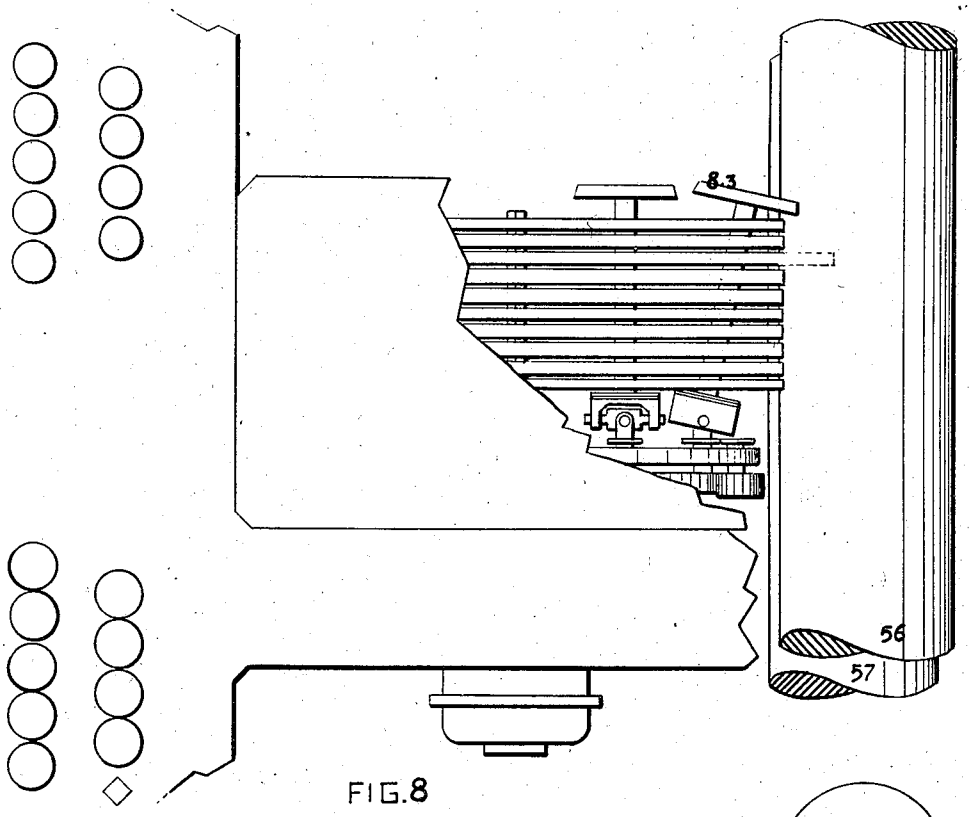


FIG.8

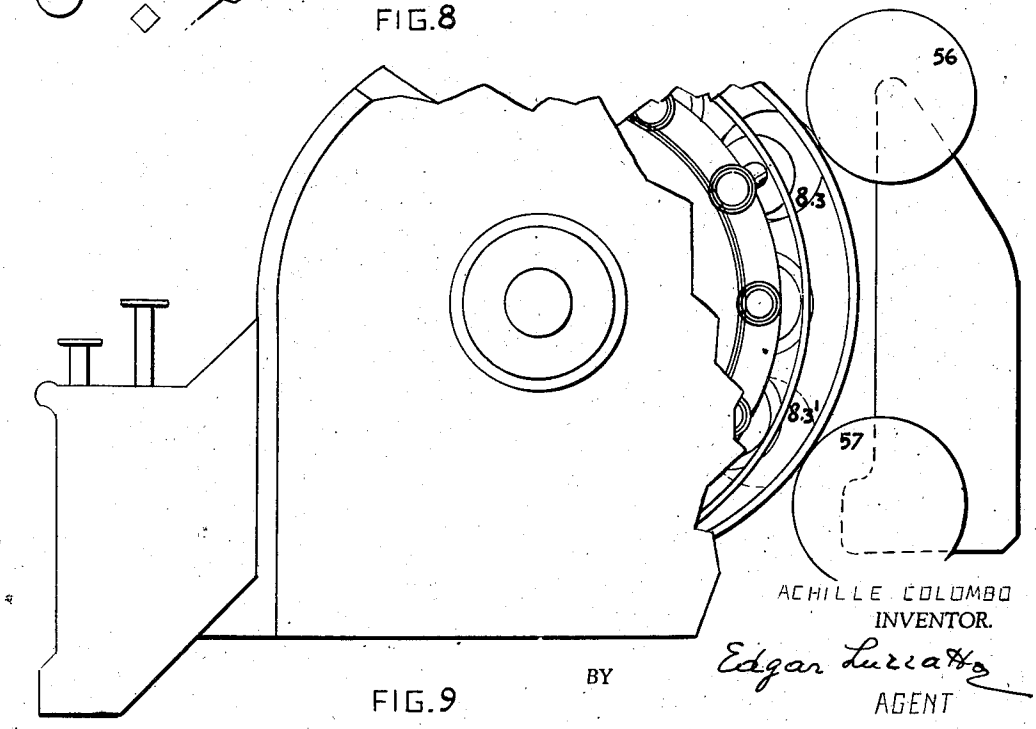


FIG.9

ACHILLE COLOMBO
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Feb. 23, 1943. A. COLOMBO 2,311,737

SILENT TYPEWRITING MACHINE

Filed Oct. 18, 1941 6 Sheets-Sheet 6

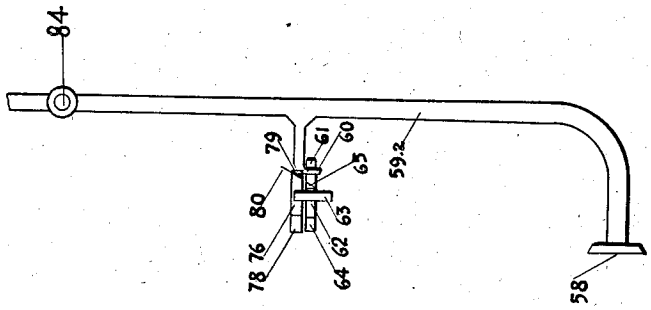


FIG 12

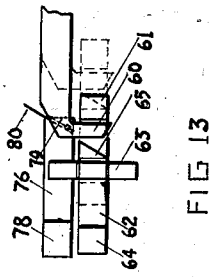


FIG 13

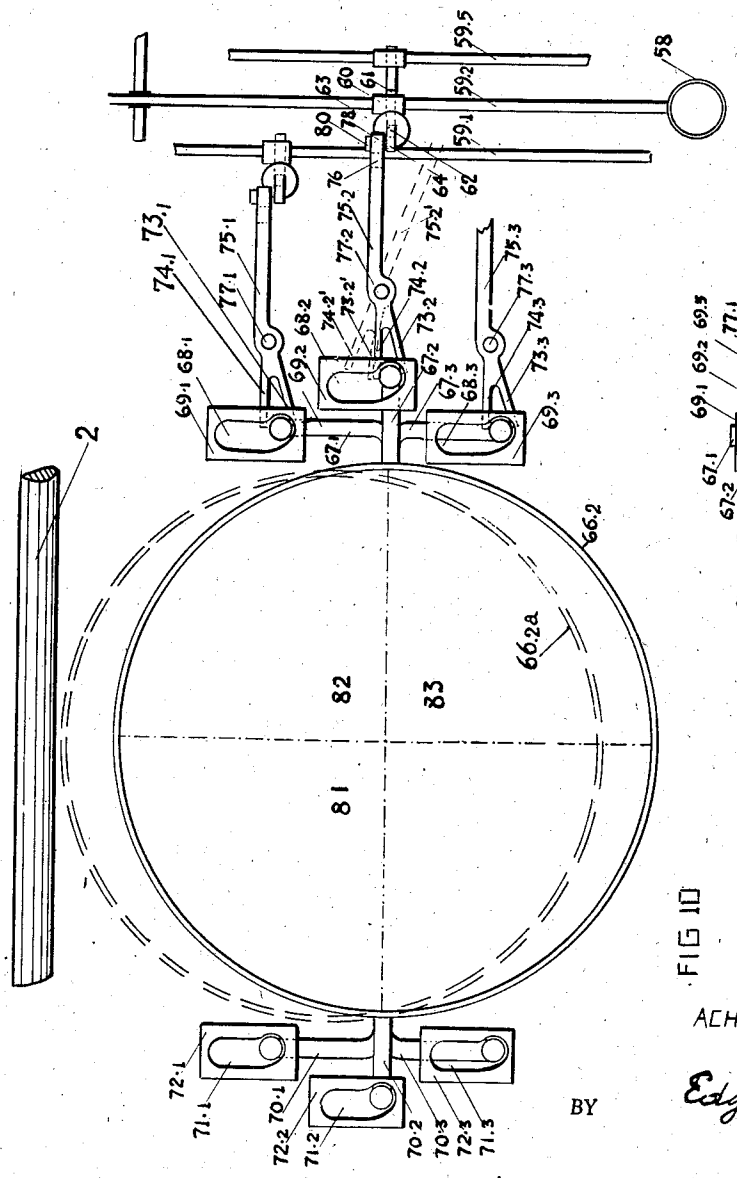


FIG 10

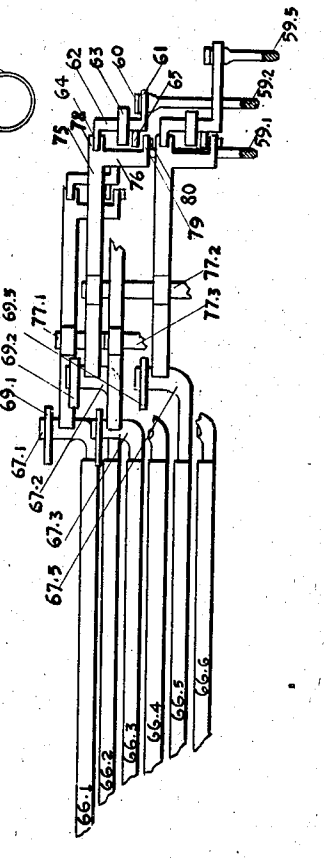


FIG 11

ACHILLE COLOMBO
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Patented Feb. 23, 1943 2,311,737

UNITED STATES PATENT OFFICE

2,311,737

SILENT TYPEWRITING MACHINE

Achille Colombo, New York, N. Y.

Application October 18, 1941, Serial No. 415,517

20 Claims. (Cl. 197—18)

This invention relates to a noiseless typewriting machine of the class of power driven typewriters with a planetary motion of the types and a rolling impression of the types on the paper. The general principles of machines of this class have already been disclosed in my copending application Ser. No. 203,593, and may be summarized as follows.

In order to obtain a rolling action of the types on the paper, each type is caused to follow a cycloidal path; each type is fastened on a cylindrical surface adapted to roll over, for a suitable period and with the desired contact pressure, on a paper-carrying roller. Said surface must therefore be integral with a planetary member having a rolling motion caused by a driving means and suitable kinematic connections, and touching the paper-carrying roller only at the point of impression.

A typewriting machine of this class involves no departure from a fundamental principle common to all other typewriters now in use, that is the uniformity in spacing of the point of typing, which is obtained by the forward motion of the roller at each stroke. Therefore the aforementioned kinematic connections are so arranged that the fixed polar curve of any one rolling type is tangent to the paper-carrying roller at the single typing point. Typewriting machines of this class may differ according to the type of kinematic connections used for obtaining the rolling action; however, all have in common the feature consisting in that the typing unit is always in movement, being connected to a driving shaft rotating continuously in one direction.

The general object of this invention is to provide a machine of the aforementioned class which comprises a plurality of type-carrying planetary members, each planetary member carrying a plurality of types, and wherein key-controlled means are provided for selecting any desired type and causing the same to leave its impression on the paper.

Another object is to provide a typewriter which comprises a small number of planetary members and is therefore simple, compact and economical.

A further object is to provide a machine which can be operated with the lightest pressure of the typist's fingers on the keys thereby permitting a fast and continued typing without fatiguing the operator.

A still further object is to provide a typewriter which has a keyboard consisting of two sets of keys, the impression of any type being brought about by depressing in quick succession two keys, the first belonging to one of the aforementioned sets of keys and the second to the other set.

A still further object is to provide a typewriter which requires little or no motion of the typist's hands about the keyboard and can therefore be operated at great speed.

Another object is to provide means whereby the same matter may be directly typed on a plurality of sheets of paper, thereby making it possible to dispense with the use of carbon paper.

Still another object is to provide means whereby the erasure of any character typed on the paper may be automatically obtained.

Other related and ancillary objects will become apparent while the description proceeds. How all these objects are attained will be readily understood by reference to the description and the drawings.

In the drawings:

Fig. 1 is a plan view, with part of the structure broken off to show the gearings of one of the two sets of keys, which will be designated as the "selector keyboard," and the mechanism controlled thereby.

Fig. 2 is a vertical section along the line 2—2 of Fig. 1.

Fig. 3 is a vertical view of the other set of keys, which will be designated as the "actuating keyboard," and the mechanism controlled thereby, said view showing also the means for the automatic erasure of the printing.

Fig. 4 is a plan view of the same structure of Fig. 3.

Fig. 5 is an end view and Fig. 5A a partial lateral view of the device designated as the "selector roller" shown in Figs. 1 and 2.

Fig. 6 is a diagram illustrating the arrangement of the types on the keys of the two keyboards.

Fig. 7 is a plan view schematically illustrating a device whereby the impression of any desired type may be brought about by depressing only one key, all keys being grouped in a single keyboard.

Fig. 8 is a plan view, with part of the structure broken off, of a typewriter according to the invention comprising a plurality of paper-carrying rollers.

Fig. 9 is a vertical view of the same structure.

Fig. 10 is a plan view of another embodiment of the mechanism controlled by the actuating keyboard.

Fig. 11 is a vertical view of the same mechanism.

Fig. 12 is a lateral view of part of the device shown in Figs. 10 and 11, and

Fig. 13 shows, on a greater scale, part of the device of Fig. 12.

In Figs. 1 to 6 there is illustrated an embodiment of my invention. In this embodiment, the "selector keyboard," so called because its keys selectively determine which one of the several types carried by each planetary member will leave its impression on the paper when one of said keys is actuated, is placed at the typist's left (that is, on the left side of the typewriter); the "actuating keyboard," so called because its keys actuate the various planetary members by causing them to shift into the writing position, is placed at the typist's right.

Referring now in detail to the drawings, the numeral 1 denotes the frame of the typewriter, only partially shown, and the numeral 2 indicates a conventional paper-carrying roller.

An electric motor 3 drives disc 4 in a continuous rotation. Rotatably carried at the periphery of disc 4 are a plurality of planetary pinions 5_1, 5_2, 5_3 . . . 5_9, in this embodiment nine in all.

To each of said pinions there is connected, by means of universal joints 6_1, 6_2, 6_3 . . . 6_9, one of planetary members 7_1, 7_2, 7_3 . . . 7_9 comprising type-carrying pads 8_1, 8_2, 8_3 . . . 8_9, guide discs 9_1, 9_2, 9_3 . . . 9_9, and pad spindles 10_1, 10_2, 10_3 . . . 10_9; the nine planetary members subtend in all 240° of the periphery of disc 4, that is two successive members subtend on said periphery an angle of 30°. In this example, each type-carrying pad (8_1 . . . 8_9) carries nine types arranged at the periphery thereof at an interval of 360°÷9=40°. In Fig. 3 there is shown a further planetary pinion 5_{10} which, however, is not connected to a planetary member comprising a type-carrying pad but to a different device, the purpose whereof will be described hereafter.

In Fig. 1 only planetary members 7_2, 7_3 and 7_4 are shown in view. The other members have been sectioned at various heights to show the various elements listed above.

Stationary gear 11, mounted on the frame of the machine, has a ball bearing on sleeve 12 which is mounted on the hub of disc 4. Said gear 11 meshes with pinions 5_1 . . . 5_9 imparting to them a planetary motion as the disc rotates. The number of teeth of said gear and pinions is a matter of judicial choice. In this example gear 11 has 108 teeth and each of the pinions has 9 teeth.

Coaxially with stationary gear 11 and on the same sleeve 12 there is mounted another stationary gear 13 meshing with a further gear 14. On the latter's shaft there is mounted a worm wheel 15 meshing with worm 16. Said worm 16 is keyed to the shaft of a selector roller 17 which is loosely mounted on bearings 18 and faces fingers 20 of selector keys 21. Said selector roller is provided with a plurality of sets of blades, each set consisting of four blades 19; two of such sets are shown in Fig. 5. Each blade 19 comprises two plates: rigid plate 22 and flexible plate 23 slightly longer than plate 22 and following this latter in a clockwise direction.

The four blades of each set 19 are mounted at 90° from each other, and the sets, which are as many as the selector keys and as many as the types on each planetary member—therefore nine in this example—are angularly staggered by 10°; that is, the four blades of any one set are mounted on the periphery of selector roller 17 in correspondence to four generatrixes which are angularly staggered by 10° from the four generatrixes of the preceding set. Each set faces finger 20 of a selector key 21.

When a selector key 21 is depressed, the corresponding finger 20 goes into the position shown in broken lines in Fig. 5, then is returned to its initial position by the action of spring 24 (shown in Fig. 2). The space covered by the downward motion of finger 20 is such that the finger must meet one, and only one, of blades 19 of the set it faces during said motion inasmuch as two lines drawn from the uppermost and from the lowermost position of the tip of finger 20 to the axis of the selector roller will make an angle of 90° with each other. Therefore, no matter what the initial position of the set of blades was before such motion of key 21, finger 20 of this latter will always bring the set of blades to the same final position, or to one of four possible positions differing from each other by a multiple of 90°.

The construction of the blades is such that finger 20 during its downward motion will act upon its set of blades as described, but, during the return upward motion of the finger due to the action of spring 24, flexible plate 23 will bend upwardly and allow said finger 20 to pass without the position of the roller being changed.

In conclusion, and disregarding any multiple of 90°, it may therefore be said that every time a key 21 is depressed the selector roller goes into a fixed position corresponding to the particular key which has been depressed, and the two positions corresponding to any two adjacent keys differ by a fixed angle, in this example by 10°.

In the embodiment illustrated, the gear ratio of the complex of gear couplings 13—14—15—16 has been made 3 to 1. Therefore every time selector roller 17 rotates by 10°, gear 11 rotates by 10°÷3 or by 1 tooth since gear 11 has 108 teeth and 36×3=108. Likewise, each of the planetary pinions 5_1 . . . 5_9 rotates by 1 tooth or by 40° as each pinion has nine teeth. As 40° is the angular interval of two adjacent types on the periphery of each type-carrying pad, as a result of this rotation each type goes into the position previously occupied by the next one.

Any point on the periphery of a type carrying pad 8_1 . . . 8_9 describes a cycloidal trajectory. This cycloidal trajectory may be an "inner trajectory" if it is contained within a circle concentric with disc 4 and tangent outwardly to all pads of Fig. 1 except pad 8_3; or it may be an "outer trajectory" if it is contained within a circle concentric with disc 4 and tangent to paper roller 2 and pad 8_3 in Fig. 1.

The arrangement of the gears is such that when one of pinions 5_1 . . . 5_9 has moved by 30° along the periphery of gear 11 because of the rotation of disc 4, its pad 8_1 . . . 8_9 will have completed one revolution about its spindle. Thus with every rotation of disc 4 by 30°, each pad is replaced by the following pad with its types in exactly the same angular position. As it will be easily seen, there are therefore only nine "inner trajectories" followed by the types. Numbering these trajectories from I to IX, we can give the roman number I to all the nine types which at a certain initial time, arbitrarily chosen, follow the trajectory I, and so on. Likewise, to each inner trajectory there corresponds an "outer trajectory." For instance, the outer trajectory I will be the trajectory followed by any type which

followed the inner trajectory I, when the pad that carries it moves to its outermost position.

Of all the outer trajectories, only one touches the paper carried by roller 2; that is, only one can be utilized for the writing and need therefore be considered. If this "operative trajectory" be the outer trajectory I, it is obvious that in order to cause a type to leave its impression on the paper it will be necessary: first, to shift said type to the inner trajectory I unless it followed already that trajectory; and, second, to shift then the pad which carries said type to its outermost or operative position (such as pad 8_3 in Fig. 1). The first operation only is controlled by the selector key.

Let us suppose that at a certain initial time, arbitrarily chosen, we had the following relationship between types and trajectories:

Types	I II III IV V VI VII VIII IX
Trajectories	I II III IV V VI VII VIII IX

The types which follow the inner trajectory corresponding to the operative trajectory will be said to be "in phase"; therefore the nine types I are initially in phase, and the types having the same roman number other than I are out of phase by the same amount. If now we want to use, for instance, one of the types III, it will be necessary to transfer all said types to the trajectory I or, in other words, to shift all the types by two places. As explained above, this is accomplished by causing gear 11 to rotate through the space of two teeth which correspond to 20° on the selector roller. The selector key which causes the selector roller to rotate by 20° will put all the nine types III in phase for operation, and will give the following distribution of types and trajectories:

Types	III IV V VI VII VIII IX I II
Trajectories	I II III IV V VI VII VIII IX

the nine types III will therefore be marked on the key which puts them in phase, and likewise for all the other types.

It is clear from the foregoing description that a rotation of 90° of the selector roller will cause a shift of nine places in the sequence of types, bringing back each type to its starting position. Rotation of the selector roller by multiples of 90° have therefore no effect whatever and may be disregarded.

Summing up:

The selector roller has nine possible positions, each univocally corresponding to a selector key 21. When the selector roller is in one of these nine positions, all of and only the types having a certain ordinal number are in phase and available for the typing, and all such types are marked on the selector key corresponding to such position of the selector roller. Each selector key will be given the same ordinal number as the types which it puts in phase, while each actuating key will be given the arabic number of the planetary member it actuates.

The actuating mechanism illustrated in Figs. 3 and 4 serves to shift any of the pads $8_1 \ldots 8_9$ to its outermost position causing the type in phase carried by the pad to shift to the operative trajectory and so to leave its impression on the paper.

To each planetary member there corresponds one of guide rings 25_1, 25_2, $25_3 \ldots 25_9$ located at such a height that the guide disc of each planetary member bears against the corresponding guide ring. In this example there are nine guide rings as there are nine planetary members; Fig. 3 shows a tenth guide ring which is provided for a purpose to be explained hereafter. As disc 4 rotates, the centrifugal force due to its rotation would cause pad spindles $10_1 \ldots 10_9$ to swing outwardly about joints $6_1 \ldots 6_9$, and the type in phase on each pad would come into contact with the paper carried by the roller. Normally, however, the rolling contact of guide discs $9_1 \ldots 9_9$ and guide rings $25_1 \ldots 25_9$ prevents said outward swing and keeps all the pads and their types away from the paper.

In Figs. 1, 2 and 3 all the pads are shown in an inoperative position wherein the guide discs and rings hold them, with the exception of pad 8_3 which has been released and is shown in the writing position. The release of the pads is brought about by depressing keys 26 of the actuating keyboard (Figs. 3 and 4) which actuate the mechanism hereafter described.

Each actuating key 26 is fastened to an actuating arm 27 pivoted at 28 to the frame of the machine. Each arm 27 engages a stud 29 carried by an L shaped lever 30, pivoted at 31 to an element of the frame of the typewriter and having the lower end slotted at 32. Each slot 32 is engaged by a stud 33 carried by a link 34 the upper end whereof engages a slot 35 in a bracket 36 carried by each guide ring. All guide rings are pivoted at 44 to an element of the frame of the machine. Each link 34 has a hook 37 adapted to engage a bar 38, said bar 38 extending perpendicularly to the plane of Fig. 3 and cooperating with all hooks 37; it is normally held in its uppermost position by spring 39. An electromagnet 40 is energized whenever a contact 41 is closed and causes bar 38 to be lowered; as soon as contact 41 is reopened, electromagnet 40 is deenergized and bar 38 is lifted again by spring 39.

In Fig. 3, one of keys 26, corresponding to guide ring 25_3, has been depressed. This causes the corresponding L shaped lever 30 to swing about 31 so that its slot 32 is carried forward and with it link 34 while spring 42 is stretched. As soon as key 26 is returned to its uppermost position by spring 43, spring 42 would draw link 34 back toward the keyboard. However, link 34 is maintained in its forwardmost position as hook 37 has been lockingly engaged by bar 38. The upper end of link 34 engaging slot 35 causes bracket 36 and guide ring 25_3 to swing about pivot 44; type-carrying pad 8_3 is thus allowed to swing outwardly about its joint 6_3 and the type in phase carried by said pad goes into the writing position. When the planetary motion of pad 8_3 causes the type in phase to come into contact with the paper, a rolling impression is left thereon. Concurrently, contact 41 is closed by joint 6_3, bar 38 is lowered and link 34 is returned by spring 42 to its initial position as electromagnet 40 has been energized.

The end of actuating arm 27, not shown in the figures, operates any conventional mechanism for letter feeding every time one of keys 26 has been depressed. After a line has been typed, the platen may be returned manually to its initial position; however, the power supplied by motor 3 may be used for the return motion, and this motion may be rendered automatic by employing any suitable device. Line feeding will be obtained in a conventional manner.

An inking ribbon will be arranged in any convenient manner, or an inking pad may be substituted therefor; said inking pad will be placed in such a position that the type in phase on the pad that is moved into the writing position will

contact the inking pad before coming into contact with the paper.

In Figs. 10 to 13 there is illustrated another embodiment of the actuating mechanism.

Numerals 66_1 to 66_6 denote six of the guide rings for the planetary members shown in Fig. 1 that are normally held in an inoperative position as already explained. Each actuating key, one of which is shown at 58, is integral with or fastened to an actuating arm; three of these arms, 59_1, 59_2, 59_5, are shown in Fig. 10. Each actuating arm is pivoted at 84 to the frame of the machine and is provided with a vertical extension having a hook 60 adapted to engage a bar 61. Said bar 61 is bent at right angle to form a vertical member 62 slidable in a sleeve 63 wherein it is normally held by friction. The upper part of 62 is provided with an elbow 64 having a square cross-section, and with a wedge-shaped extension 65.

Each guide ring carries two brackets in the position shown in Fig. 10 and having an end portion adapted to act as a follower in a cam slot as described hereafter. There are therefore two sets of such brackets, three of each set being shown at 67_1, 67_2, 67_3 and 70_1, 70_2, 70_3. To said two sets there correspond two sets of plates fastened to the machine, of which there are shown plates 69_1, 69_2, 69_3 and 72_1, 72_2, 72_3.

Each plate is provided with a cam slot, as shown at 68_1, 68_2 68_3 and 71_1, 71_2 71_3, each slot being adapted to engage the aforementioned end portion, or follower, of one of brackets 67_1, etc., and 70_1, etc. slidable in said cam slots.

A number of rocker arms are pivoted to the machine intermediate their ends, there being as many arms as there are guide rings and actuating keys, therefore nine in this example. Said arms have a fork adapted to engage the followers of the brackets. In Fig. 10 there are shown three arms, 75_1, 75_2, 75_3, having forks 73_1—74_1, 73_2—74_2, 73_3—74_3 and pivoted at 77_1, 77_2, and 77_3 respectively.

End 78 of each of said arms normally bears against 64 which prevents the motion of the arm, and each arm is provided with a lateral extension 76 at a right angle with the arm and having a wedge-shaped portion 79. This latter carries a rigid blade 80 which is longer than 79 and is hinged thereon, as shown on a greater scale in Fig. 13.

Supposing now that the typewriter is in operation, and the planetary members are rotating in a clockwise direction, it will be obvious that each planetary member will exert an outward thrust against its guide ring owing to the action of the centrifugal force.

An outward thrust at any point comprised in quadrant 81 will cause guide ring 66_2 to move toward the paper-carrying roller and to assume position 66_{2a}, shown in broken lines, as the followers on brackets 67_2 and 70_2 will be allowed to slide forward in cam slots 68_2 and 71_2 owing to the profile of said cam slots; a type-carrying pad will be therefore released and will come into contact with the paper.

If the outward thrust is exerted at a point comprised in quadrant 83, then the profile of the cam slots will prevent any motion of the followers and the guide ring will not be allowed to assume position 66_{2a}. If the outward thrust is exerted at a point comprised within quadrant 83, then no motion of ring 66_2 will take place owing to the position of the followers in their cam slots, unless guide ring 66_2 had been previously caused to assume position 66_{2a}. In this case, the guide ring will be caused to move backward and away from the paper-carrying roller, and the guide ring together with its type-carrying pad will be returned to its normal inoperative position.

However, the guide rings are normally prevented from yielding to the outward thrust exerted in quadrant 81 until the corresponding key of the actuating keyboard has been depressed by the operator, for instance key 58 which corresponds to guide ring 66_2 in Figs. 10 and 11.

The release of the guide ring is obtained as follows.

When key 58 is depressed, hook 60 engages bar 61 and pulls it down as member 62 may slide in sleeve 63. Extension 64 of member 62 will also be lowered thereby releasing end 78 of corresponding rocker arm 75_2.

Concurrently, wedge-shaped member 79 will be free to move along the upper horizontal face of wedge-shaped extension 65, while rigid blade 80 hinged on 79 will be free to pass over 65 swinging about its hinges.

As end 78 of a rocker arm 75_2 has been released, said arm is free to swing about 77_2 and move to position $75_{2'}$ as shown in broken lines in Fig. 10; fork 73_2—74_2 which engages the follower of bracket 67_2 will no longer prevent the latter from moving in cam slot 68_2 (as well as follower 70_2 in cam slot 71_2) when ring 66_2 is urged toward the paper-carrying roller by an outward thrust in quadrant 81.

Ring 66_2 will therefore assume position 66_{2a} and the corresponding type-carrying pad will be released and will come into contact with the paper.

When the outward thrust is transferred to quadrant 83, 66_2 will be urged backward and away from the paper, and the followers of brackets 67_2 and 70_2 will move backward in their cam slots returning to their initial position. Concurrently, 67_2 will engage again fork 73_2—74_2, and the tip of blade 80 will engage 65 lifting it and therefore also 61, so that all parts of the mechanism will be returned to their initial position.

It will be readily understood that the principles and the construction of the typewriter make it possible to provide simple means for the automatic erasure of any type printed on the paper. Figs. 3 and 4 illustrate a device that may be used for this purpose.

As shown in Fig. 1, planetary pinions 5_1 . . . 5_9 do not occupy the whole periphery of disc 4; a further planetary pinion 5_{10} may therefore be placed in the space comprised between planetary pinions 5_8 and 5_9 in a position intermediate these latter, said further planetary pinion also being rotatably carried at the periphery of disc 4 and meshing with stationary gear 11. The upper end portion of pinion 5_{10} is provided with a small gear 52; a further gear 53 meshes with gear 52 and therefore rotates in the opposite direction. Erasing member 8_{10} is connected to gear 53 by means of a spindle and universal joint 6_{10}, this latter being of such a size and shape as to prevent it from closing contact 41 and energizing electromagnet 40. A guide disc, not shown, corresponding to guide discs 9_1 . . . 9_9 of the other planetary members, rollingly engages guide ring 25_{10} and normally prevents the eraser from coming into contact with the paper.

By depressing a special key, shown as square key 54 in Fig. 4, connected with a conventional actuating mechanism, guide ring 25_{10} pivoted at

44 to the frame of the machine will be swung outwardly and the spindle of eraser 8_{10} will be released and allowed to swing outwardly about joint 6_{10}, thereby bringing the eraser into contact with the paper. A repeated action of the eraser and a complete erasure may be insured by keeping key 54 depressed for a sufficient length of time. To enhance the action of the centrifugal force and to insure a sufficient contact pressure with the paper, spring 55 is mounted on disc 4 with an end bearing against the spindle of the eraser, thereby constantly urging this latter outwardly. Another spring, not shown, will return the key, the actuating mechanism, the guide ring and the eraser to their initial position as soon as the key is released.

The arrangement of the keys on the keyboard of the typewriter is illustrated in Fig. 6 wherein the keys shown on the left side are selector keys and those shown on the right side are actuating keys. It will be readily understood that in order to write, for instance, the letter "H" it is necessary to depress first the left uppermost key, putting in phase all the nine types H K L B C D F G M, and then the right uppermost key which actuates a pad carrying only H of all said nine types.

An arrangement of the various types is shown in the following self-explanatory table:

Ordinal number of selector key (= ordinal number of type)	Number of actuating key (=number of planetary member)								
	1	2	3	4	5	6	7	8	9
I	0	2	3	4	5	6	7	8	9
II	a	e	i	o	u	A	E	I	U
III	b	c	d	q	f	G	H	K	L	m
IV	n	p	q	r	s	t	v	y	z
V	B	C	D	F	g	h	k	l	M
VI	N	P	Q	R	S	?	!	V	Y	Z
VII	.	,	:	;	j	J	-	=	—
VIII	w	W	x	X	"	(	)	£	+	%
IX	&	°	'	,			$			$

All the characters entered in a horizontal line are in phase together, or out of phase by the same amount; they are marked on the same selector key. All the characters entered in a vertical column are carried by the same planetary member; they are marked on the same actuating key. Thus, for instance, by depressing selector key IV and actuating key 4 the character "r" is typed, and each character can thus be designated by the combination of a roman and an arabic number.

It is to be noted that the construction of the machine lends itself readily to the adoption of means whereby the types are caused to leave their impression directly on a plurality of sheets of paper so that the same matter may be printed on more than one sheet without using any carbon paper.

As shown in Figs. 8 and 9, to obtain this result the whole construction shown in Figs. 1 to 4, with the exception of the keyboards, is arranged in a vertical position with respect to the frame of the typewriter, disc 4 rotating continuously in a vertical plane. Fingers 20 of keys 21 and actuating arms 27 of keys 26 will be shaped in such a manner as to allow of their operation notwithstanding the different position of the whole structure, this being a matter of mere mechanical skill. A plurality of type-carrying rollers, in this example the two rollers 56 and 57, are placed in a suitable position so that when one of guide rings 25_1 . . . 25_{10} is swung outwardly and the corresponding type-carrying pad is released, the type in phase on said pad will come into contact first with roller 56 and then with roller 57 in the position $8_{3'}$, as in this embodiment disc 4 rotates in a clockwise direction.

The angular distance between the two rollers is determined by the following consideration: as each type on the periphery of a pad will be brought to the same position every time the pad completes a revolution about its spindle, the angular distance between the two rollers must be such as to allow of one or more complete revolutions of the pad between the point of contact of a type with one of the rollers and its point of contact with the following roller.

Contact 41, the function of which has been hereinbefore described, will be placed in such a position as to be closed by joint 6_3 of pad 8_3 only when the type comes into contact with the last paper-carrying roller, roller 57 in Fig. 9 as disc 4 rotates in a clockwise direction.

Suitable connections will allow of the simultaneous letter feeding and line feeding of the rollers.

A typewriter according to my invention offers a great many practical advantages in comparison with conventional typewriters. The impression of the types on the paper being obtained by means of a rolling contact of the types with the paper, the operation of the machine is noiseless to a high degree; the continuous motion imparted to the type-carrying pads results in a high typing speed. The automatic erasure and the simultaneous printing on a plurality of sheets of paper are additional interesting features.

It may be objected that the arrangement of the keys in two separate keyboards, and the necessity of depressing two separate keys in quick succession in order to effect the impression of a type on the paper (in the embodiment of Figs. 1 to 6) will complicate and slow down the operation of the machine. This however is not true. The necessity of depressing two keys instead of one is more than offset by the many advantages offered; after little practice, a typist will be able to write much faster than with conventional machines, particularly because with the arrangement described all types are grouped on nine keys only so that very little motion of the hands about the keyboard is required to select the desired character and depress the corresponding key. All characters most frequently used can be grouped on only five keys, so that most of the time the typist's hands will be substantially stationary on the keyboards and only a slight motion of the fingers will be required to effect the typing. Moreover, owing to the fact that the typing is effected by means of a rolling contact of the types and the machine is power-driven, it will be sufficient to touch the keys lightly. Furthermore, the foregoing description clearly shows that there is no need, as in conventional typewriters, to depress a special key for shifting the platen every time a capital has to be typed. A prolonged typing is possible without fatiguing the operator.

As there is required very little motion of the hands and fingers, even an inexperienced operator can type much faster than with a conventional typewriter. Indeed, while many typists are unable to use all their fingers when the hands have to be shifted rapidly and continuously

about the keyboard, it will be a simple matter to learn to use all the fingers of a hand when the latter is practically stationary on the keyboard.

Further, it is to be noted that the grouping of all characters on a limited number of keys may be made in such a manner as to aid the operator in remembering on which key the desired character is to be found; this will contribute to a faster typing on the part of an inexperienced operator. It might indeed be said that the noiseless character of my machine and its great speed of operation render it a convenient substitute for shorthand writing.

Without departing from the spirit of my invention, it is however possible to provide a single keyboard, and to effect the impression of any desired type by depressing only one key, as in conventional typewriters. Any key will actuate in succession the selector roller and the actuating mechanism, and the principles of my invention will remain unchanged.

Fig. 7 is a schematical illustration of a device which may be employed for this purpose.

Each finger **20** of keys **21** will be provided with an extension **46**, extending backward of keys **21** and at a right angle with fingers **20** in the plane of Fig. 7. Each of said extensions is connected at **50** with one end of nine bars **48** (as many as the types carried by each pad) and the other end of said bars is provided with keys **49** forming the actual keyboard of the machine. A single character is marked on each key. Therefore there are as many bars **48** as there are types, in this example 81 bars only partially shown in the figure. When a key **49** is depressed, one of the nine extensions **46** is acted upon and therefore the selector roller is actuated. Each bar **48** is provided at a point intermediate its ends, conveniently chosen so as to permit free operation of the device, with a plunger-like element **51** fastened thereto. To each bar **48** there corresponds a bar **47** one end whereof is connected to one of keys **26** of the actuating keyboard and therefore also to one of the corresponding arms **27**. When one of bars **48** is lowered by depressing one of keys **49**, the plunger-like element **51** thereof acts upon the corresponding bar **47** thereby actuating the pad releasing device through one of keys **26**. The connections will be made in such a manner that each key **49** will actuate both the selector key **21** which puts in phase the nine types comprising the one marked on said key **49**, and the actuating key **26** which releases the pad carrying only that type of all nine put in phase. It will be readily understood that the characters need not be marked on keys **21** and **26** which need not be accessible to the typist.

In this arrangement there are, as mentioned, as many keys as there are types, therefore 81; however, a conventional keyboard of about 42 keys may be easily provided. For this purpose, the types will be arranged at the periphery of the pads on two lines vertically spaced by a suitable interval, each type of one line being directly above a type of the other line. A conventional device will allow of the vertical shift of the platen, thereby determining which line has its types in the position required for coming into contact with the paper. Obviously, two characters will then be marked on each key and the number of type-carrying pads will be reduced by half.

It will be understood that the foregoing description has been given merely by way of example and that many changes may be made in the devices illustrated without departing from the spirit of the invention or exceeding the scope of the claims.

What I claim is:

1. A silent typewriting machine comprising, in combination with a paper-carrying roller, a driving shaft rotating continuously in one direction, a disc keyed to said shaft, a stationary gear coaxial with said disc, a plurality of planetary pinions rotatably mounted at the periphery of said disc and meshing with said stationary gear, a plurality of type-carrying pads each associated with one of said planetary pinions and driven thereby with a continuous planetary motion, each of said pads carrying a plurality of types and being movable between an inoperative position and a writing position, key-controlled means for selectively moving any one of said pads into the writing position, and key-controlled means for selectively causing any one of the types carried by the pad that is moved into the writing position to leave its impression on the paper.

2. A silent typewriting machine comprising, in combination with a paper-carrying roller, a driving shaft rotating continuously in one direction, a disc keyed to said shaft, a stationary gear coaxial with said disc, a plurality of planetary pinions rotatably mounted at the periphery of said disc and meshing with said stationary gear, a plurality of type-carrying pads each associated with one of said planetary pinions and driven thereby with a continuous planetary motion, each of said pads carrying a plurality of types and being movable between an inoperative position and a writing position, a set of keys, means controlled by said set of keys for selectively moving any one of said pads into the writing position, another set of keys, and means controlled by said last mentioned set of keys for selectively causing any one of the types carried by the pad that is moved into the writing position to leave its impression on the paper.

3. A silent typewriting machine comprising, in combination with a paper-carrying roller, a driving shaft rotating continuously in one direction, a disc keyed to said shaft, a stationary gear coaxial with said disc, a plurality of planetary pinions rotatably mounted at the periphery of said disc and meshing with said stationary gear, a plurality of type-carrying pads each associated with one of said planetary pinions and driven thereby with a continuous planetary motion, each of said pads carrying a plurality of types and being movable between an inoperative and a writing position, a set of keys, means for selectively moving any one of said pads into the writing position, and means for selectively causing any one of the types carried by the pad that is moved into the writing position to leave its impression on the paper, both said means being operatively connected to and jointly controlled by said aforementioned set of keys.

4. In a silent typewriting machine, in combination: a plurality of paper-carrying rollers, a driving shaft rotating continuously in one direction, a disc keyed to said shaft, a stationary gear coaxial with said disc, a plurality of planetary pinions rotatable carried at the periphery of said disc and meshing with said stationary gear, a plurality of type-carrying pads each associated with one of said planetary pinions and driven thereby with a continuous planetary motion, each of said types carrying a plurality of types and being normally held in an inoperative position,

key-controlled means for selectively causing any one of said type-carrying pads to move from the inoperative position to a number of writing positions wherein said pads come successively into contact with each of said aforementioned paper-carrying rollers, and key-controlled means for selectively causing any one of the types carried by the pad that is moved into the writing positions to leave its impression on the paper.

5. A silent typewriting machine comprising, in combination with a paper-carrying roller, a driving shaft rotating continuously in one direction, a disc keyed to said shaft, a stationary gear coaxial with said disc, a plurality of planetary pinions rotatably mounted at the periphery of said disc and meshing with said stationary gear, a plurality of type-carrying pads each associated with one of said planetary pinions and driven thereby with a continuous planetary motion, each of said pads being movable between an inoperative position and a writing position, key-controlled means for selectively moving any one of said pads into the writing position, an eraser-carrying member also associated with one of said aforementioned planetary pinions, said member being movable between an inoperative position and an operative position wherein it is caused to come into contact with the paper carried by the roller, and key-controlled means for shifting said member into the operative position.

6. A silent typewriter machine comprising, in combination with a paper-carrying roller, a driving shaft rotating continuously in one direction, a disc keyed to said shaft, a stationary gear coaxial with said disc, a plurality of planetary pinions rotatably mounted at the periphery of said disc and meshing with said stationary gear, a plurality of type-carrying pads each associated with one of said planetary pinions and driven thereby with a continuous planetary motion, each of said pads carrying a plurality of types and having a spindle, and each spindle being connected to one of said planetary pinions by means of a universal joint whereby said pads are urged outwardly by the centrifugal force due to the rotation of said disc, means for normally holding said pads in an inner inoperative position, key-controlled means for releasing any one of said pads and allowing it to swing outwardly into a writing position, and key-controlled means for selectively causing any one of the types carried by the pad that is moved into the writing position to leave its impression on the paper.

7. A silent typewriting machine comprising, in combination with a paper-carrying roller, a driving shaft rotating continuously in one direction, a disc keyed to said shaft, a stationary gear coaxial with said disc, a plurality of planetary pinions rotatably mounted at the periphery of said disc and meshing with said stationary gear, a plurality of type-carrying pads each associated with one of said planetary pinions and driven thereby with a continuous planetary motion, each of said pads carrying a plurality of types and having a spindle, and each spindle being connected to one of said planetary pinions by means of a universal joint whereby said pads are urged outwardly by the centrifugal force due to the rotation of said disc, a plurality of guide rings pivotally mounted on a stationary element of the machine, a guide disc on each of said pad spindles rollingly engaging one of said guide rings whereby said pads are normally held in an inner inoperative position, key-controlled means for swinging any one of said guide rings outwardly thereby releasing one of said pads and allowing it to swing outwardly into a writing position, key-controlled means for selectively causing any one of the types carried by the pad that is moved into the writing position to leave its impression on the paper, and means for automatically returning the guide disc and the pad thus swung outwardly to the inner inoperative position.

8. In a silent typewriting machine, in combination: a paper-carrying roller, a driving shaft rotating continuously in one direction, a disc keyed to said shaft, a stationary gear coaxial with said disc, a plurality of planetary pinions rotatably mounted at the periphery of said disc and meshing with said stationary gear, a plurality of type-carrying pads each associated with one of said planetary pinions and driven thereby with a continuous planetary motion, each of said pads having a spindle, and each of said spindles being connected to one of said planetary pinions by means of a universal joint whereby said pads are urged outwardly by the centrifugal force due to the rotation of said disc, means for normally holding said pads in an inner inoperative position, key-controlled means for releasing any one of said pads and allowing it to swing outwardly into a writing position, and means for automatically returning said pad to the inoperative position as soon as a character has been typed on the paper.

9. A silent typewriting machine comprising, in combination with a paper-carrying roller, a driving shaft rotating continuously in one direction, a disc keyed to said shaft, a stationary gear coaxial with said disc, a plurality of planetary pinions rotatably mounted at the periphery of said disc and meshing with said stationary gear, a plurality of type-carrying pads each associated with one of said planetary pinions and driven thereby with a continuous planetary motion, each of said pads carrying a plurality of types and having a spindle, and each spindle being connected to one of said planetary pinions by means of a universal joint whereby said pads are urged outwardly by the centrifugal force due to the rotation of said disc, a plurality of guide rings pivotally mounted on a stationary element of the machine, a guide disc on each of said pad spindles rollingly engaging one of said guide rings whereby said pads are normally held in an inner inoperative position, key-actuated links for swinging any one of said guide rings outwardly thereby releasing one of said pads and allowing it to swing outwardly into a writing position, a locking member for holding said links and guide rings in said outward position, an electromagnet adapted to release said locking member, means for energizing said electromagnet as soon as a character has been typed on the paper, and resilient means for returning said links, guide rings and pads to the initial position thereof when said electromagnet releases said locking member.

10. A silent typewriting machine comprising, in combination with a paper-carrying roller, a driving shaft rotating continuously in one direction, a disc keyed to said shaft, a stationary gear coaxial with said disc, a plurality of planetary pinions rotatably mounted at the periphery of said disc and meshing with said stationary gear, a plurality of type-carrying pads, each of said pads having a spindle and being associated with one of said planetary pinions and driven thereby with a continuous planetary motion, each of said pads carrying a plurality of types and being movable between an inoperative position and a writ-

ing position, a set of keys, means controlled by said set of keys for selectively moving any one of said pads into the writing position, another set of keys, and means controlled by said last mentioned set of keys for rotating said aforementioned stationary gear through any desired angle thereby causing each of said type-carrying pads to rotate about its spindle through a related angle and causing the desired one among the types carried by the pad that is moved into the writing position to leave its impression on the paper.

11. A silent typewriting machine comprising, in combination with a paper-carrying roller, a driving shaft rotating continuously in one direction, a disc keyed to said shaft, a stationary gear coaxial with said disc, a plurality of planetary pinions rotatably mounted at the periphery of said disc and meshing with said stationary gear, a plurality of type-carrying pads each associated with one of said planetary pinions and driven thereby with a continuous planetary motion, each of said pads carrying a plurality of types and being movable between an inoperative position and a writing position, a set of keys, means controlled by said set of keys for selectively moving any one of said pads into the writing position, another set of keys comprising a number of selector keys equal to the maximum number of types carried by any of said pads, a selector roller having a number of possible angular positions equal to the number of selector keys, means for causing said selector roller to assume a univocally determined angular position when one of said selector keys is depressed, and to maintain same until another selector key is depressed, and gear means univocally relating said angular positions of said selector roller to as many angular positions of said aforementioned stationary gear, the angular position of said stationary gear determining which of the types carried by each pad will leave its impression on the paper when the pad is shifted into the writing position.

12. A silent typewriting machine comprising, in combination with a paper-carrying roller, a driving shaft rotating continuously in one direction, a disc keyed to said shaft, a stationary gear coaxial with said disc, a plurality of planetary pinions rotatably mounted at the periphery of said disc and meshing with said stationary gear, a plurality of type-carrying pads each associated with one of said planetary pinions and driven thereby with a continuous planetary motion, each of said pads carrying a plurality of types and being movable between an inoperative position and a writing position, a set of keys, means controlled by said set of keys for selectively moving any one of said pads into the writing position, another set of keys comprising as many keys as the highest number of types carried by any of said pads, each of said last-mentioned keys having a finger, a selector roller carrying a plurality of sets of radial blades longitudinally spaced and angularly staggered by a convenient angle, each set of blades being associated with one of said last-mentioned keys and adapted to be engaged by the finger thereof when the key is depressed thereby rotating the selector roller and causing it to assume an angular position univocally depending on the key which has been depressed, and gear means univocally relating the angular position of said selector roller to that of said aforementioned stationary gear, this latter determining which of the types carried by each pad will leave its impression on the paper when the pad is shifted into the writing position.

13. A silent typewriting machine comprising, in combination with a paper-carrying roller, a driving shaft rotating continuously in one direction, a disc keyed to said shaft, a stationary gear coaxial with said disc, a plurality of planetary pinions rotatably mounted at the periphery of said disc and meshing with said stationary gear, a plurality of type-carrying pads each associated with one of said planetary pinions and driven thereby with a continuous planetary motion, each of said pads carrying a plurality of types and having a spindle, and each spindle being connected to one of said planetary pinions by means of a universal joint whereby said pads are urged outwardly by the centrifugal force due to the rotation of said disc, means for normally holding said pads in an inner inoperative position, key-controlled means for releasing any one of said pads and allowing it to swing outwardly into a writing position, and key-controlled means for rotating said aforementioned stationary gear through any desired angle thereby causing each of said type-carrying pads to rotate about its spindle through a related angle.

14. A silent typewriting machine comprising, in combination with a paper-carrying roller, a driving shaft rotating continuously in one direction, a disc keyed to said shaft, a stationary gear coaxial with said disc, a plurality of planetary pinions rotatably mounted at the periphery of said disc and meshing with said stationary gear, a plurality of type-carrying pads each associated with one of said planetary pinions and driven thereby with a continuous planetary motion, each of said pads carrying a plurality of types and having a spindle, and each spindle being connected to one of said planetary pinions by means of a universal joint whereby the pads are urged outwardly by the centrifugal force due to the rotation of said disc, a plurality of guide rings pivotally mounted on a stationary element of the machine, a guide disc on each of said pad spindles rollingly engaging one of said guide rings whereby said pads are normally held in an inner inoperative position, key-controlled means for swinging any one of said guide rings outwardly thereby releasing one of said pads and allowing it to swing outwardly into a writing position, key-controlled means for rotating said aforementioned stationary gear through any desired angle thereby causing each of said pads to rotate about its spindle through a related angle, and means for automatically returning the guide ring and the pad thus swung outwardly to an inner inoperative position.

15. In a silent typewriting machine, in combination with a paper-carrying roller: a driving shaft rotating continuously in one direction, a disc keyed to said shaft, a stationary gear coaxial with said disc, a plurality of planetary pinions rotatably mounted at the periphery of said disc and meshing with said stationary gear, a plurality of type-carrying pads each associated with one of said planetary pinions and driven thereby with a continuous planetary motion, each of said pads carrying a plurality of types and having a spindle, a plurality of universal joints connecting each of said spindles with one of said planetary pinions, a plurality of guide rings pivotally mounted on a stationary element of the typewriter, a guide disc on each of said pad spindles rollingly engaging one of said guide rings, key-actuated links for swinging any one of

said guide rings outwardly, a locking member for holding said links and guide rings in said outward position, an electromagnet adapted to release said locking member, means for energizing said electromagnet as soon as a character has been typed, resilient means for returning said links, guide rings and pads to the initial position thereof when said electromagnet releases said locking member, and key-controlled means for rotating said aforementioned stationary gear through any desired angle thereby causing each of said type-carrying pads to rotate about its spindle through a related angle.

16. A silent typewriting machine comprising, in combination with a paper-carrying roller, a driving shaft rotating continuously in one direction, a disc keyed to said shaft, a stationary gear coaxial with said disc, a plurality of planetary pinions rotatably mounted at the periphery of said disc and meshing with said stationary gear, a plurality of type-carrying pads each associated with one of said planetary pinions and driven thereby with a continuous planetary motion, each of said pads carrying a plurality of types and being adapted to be urged outwardly by the centrifugal force due to the rotation of said disc, movable members adapted to yield to the outward thrust exerted by said pads whereby these latter are allowed to move from an inoperative position to a writing position and to return to the inoperative position after the writing has been effected, means for locking said members and normally holding said pads in the inoperative position, key-controlled means for releasing any one of said movable members, and key-controlled means for selectively causing any one of the types carried by the pad that is moved into the writing position to leave its impression on the paper.

17. A silent typewriting machine comprising, in combination with a paper-carrying roller, a driving shaft rotating continuously in one direction, a disc keyed to said shaft, a stationary gear coaxial with said disc, a plurality of planetary pinions rotatably mounted at the periphery of said disc and meshing with said stationary gear, a plurality of type-carrying pads each associated with one of said planetary pinions and driven thereby with a continuous planetary motion, each of said pads carrying a plurality of types and having a spindle and each spindle being connected to one of said planetary pinions by means of a universal joint whereby said pads are urged outwardly by the centrifugal force due to the rotation of said disc, a plurality of guide rings, a guide disc on each of said pad spindles rollingly bearing against one of said guide rings, a plurality of plates mounted on a stationary element of the machine and having cam slots, a plurality of followers rigidly connected to said guide rings and engaging said cam slots, the profile of the cam slots being such that the outward thrust exerted by said guide discs on said guide rings causes these latter to move toward the paper-carrying roller, thereby allowing the type-carrying pads to move from an inoperative position to a writing position, and, subsequently to the writing, causes said guide rings and said pads to move back into the inoperative position, means for locking said guide rings and normally holding the pads in the inoperative position, and key-controlled means for releasing said guide rings.

18. A silent typewriting machine as in claim 17, wherein the means for locking the guide rings and holding the pads in an inoperative position comprise, for each of the followers rigidly connected to the guide rings, a rocker arm having one end adapted to engage said follower, and a member normally engaging the other end of said rocker arm and locking this latter in a position wherein it prevents any motion of said follower, said member being operatively connected to said key-controlled means and being movable out of engagement with said rocker arm when said key-controlled means are actuated.

19. A silent typewriting machine as in claim 7, wherein the means for selectively causing any one of the types carried by the pad that is moved into the writing position to leave its impression on the paper comprise: a set of keys having a number of selector keys equal to the maximum number of types carried by any of the pads, a selector roller having a number of possible angular positions equal to the number of selector keys, means for causing said selector roller to assume a univocally determined angular position when one of said selector keys is depressed and to maintain same until another selector key is depressed, and gear means univocally relating said angular positions of the selector roller to as many angular positions of the stationary gear, the angular position of said stationary gear determining which of the types carried by each pad will leave its impression on the paper when the pad is shifted into a writing position.

20. A silent typewriting machine as in claim 6, wherein the means for selectively causing any one of the types carried by the pad that is moved into the writing position to leave its impression on the paper comprise: a set of keys having as many keys as the highest number of types carried by any of the pads, each of said keys having a finger, a selector roller carrying a plurality of sets of radial blades longitudinally spaced and angularly staggered by a convenient angle, each set of blades being associated with one of said keys and adapted to be engaged by a finger thereof when the key is depressed, thereby rotating the selector roller and causing it to assume an angular position univocally depending on the key which has been depressed, and gear means univocally relating the angular position of said selector roller to that of the stationary gear, this latter determining which of the types carried by each pad will leave its impression on the paper when the pad is shifted into a writing position.

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