

[54] **KEY FOR THE KEYBOARDS OF ELECTRIC-INPUT OFFICE MACHINES**

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[56] **References Cited**

**UNITED STATES PATENTS**

1,906,588	5/1933	Helmond.....200/70
3,388,226	6/1968	Willcox.....200/160 X
3,259,806	7/1966	Reed.....197/98 UX
2,198,818	4/1940	Helmond.....197/102
2,615,548	10/1952	Hopkins et al.....197/102
2,919,004	12/1959	Henatsch.....197/19
3,117,199	1/1964	Millerwise.....200/160 UX

3,210,484	10/1965	Dorsey.....197/98 UX
3,311,210	3/1967	Peroni.....197/98
3,316,377	4/1967	Olson.....200/160
3,449,538	6/1969	Long.....200/160

**FOREIGN PATENTS OR APPLICATIONS**

1,168,686	9/1958	France.....200/159
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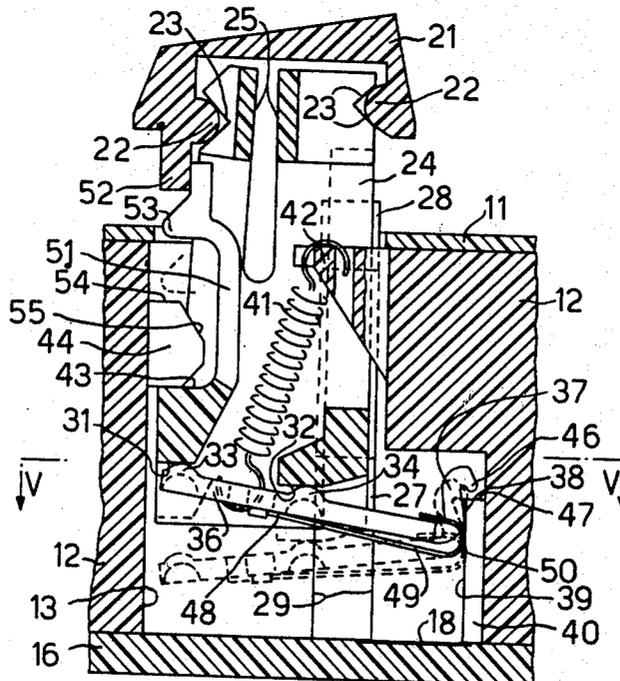
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[57] **ABSTRACT**

A key for use in keyboards of electric-input office machines includes a shank for operating a movable electric contact that closes a circuit by touching on a fixed electric contact. The movable electric contact is carried by an insulating plate normally held by a spring to bear against the shank of the key, and is provided with a hook element engaging a fixed shoulder during a first part of the depression stroke of the key to tension the spring. The hook element is released from the shoulder towards the end of the stroke to permit the spring to cause the plate to jump and the movable contact to touch the fixed contact temporarily through inertia, the spring then returning the plate to a position in which the movable contact is separated from the fixed contact.

**10 Claims, 7 Drawing Figures**





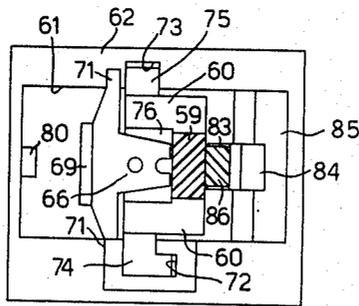
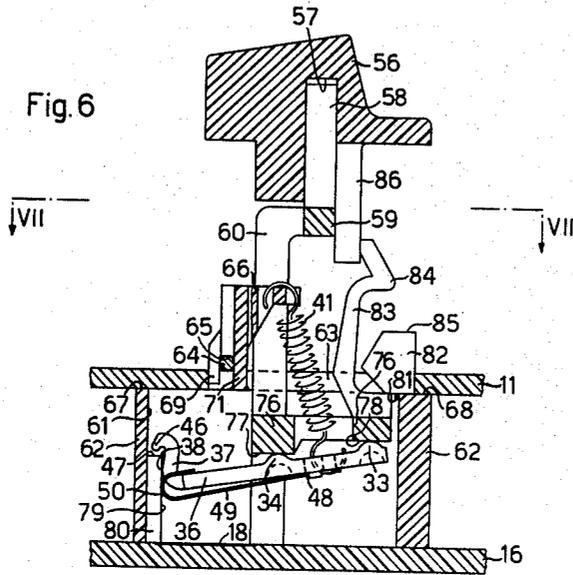


Fig. 7

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## KEY FOR THE KEYBOARDS OF ELECTRIC-INPUT OFFICE MACHINES

### BACKGROUND OF THE INVENTION

The present invention relates to a key for the keyboards of electric-input office machines, including a shank operable on at least one movable electric contact adapted to close a circuit by touching on a fixed electric contact. More particularly, the invention relates to keys adapted to generate electric pulses for entering data coded in accordance with a combination code into a machine.

Various keys for keyboards of the aforesaid type are known. In accounting machines, teleprinters or such machines, the pulses are generally produced by members actuated for a given time through the medium of a universal bar, which is actuated cyclically by a motor. These keyboards are therefore generally slow.

A keyboard has also been proposed in which each key acts by means of the shank on an electric contact which actuates a relay when it is closed. The relay gives a signal which is modified by means of diode limiter circuits in such manner as to generate a pulse of predetermined duration and characteristics. The need for the relay and the limiter circuit makes the keyboard very complicated and costly.

### SUMMARY OF THE INVENTION

The object of this invention is to enable the generation of a pulse signal on a non-motor-driven keyboard in which the duration of the pulse is determined by the mechanical characteristics of the key.

According to the invention, there is provided a key for the keyboard of an electric-input office machine, including a shank operable on at least one movable electric contact adapted to close a circuit by touching on a fixed electric contact. The movable electric contact is carried by an insulating plate normally held by a spring so that it bears against the shank of the key. A hook element is connected to the plate and is adapted to engage a fixed shoulder during a first part of the depression stroke of the key, hereby tensioning the spring. The hook element is arranged to release from the shoulder towards the end of the stroke to permit the spring to cause the plate to jump so as to cause the movable contact to touch the fixed contact temporarily through inertia. The spring then returns the plate to a position in which the movable contact is separated from the fixed contact. As a result of this sequence an electric signal in the form of a pulse is generated.

### BRIEF DESCRIPTION OF THE DRAWING

A preferred constructional form of the invention is dealt with in the following description and shown, by way of example, in the accompanying drawing, wherein:

FIG. 1 is a view, partly in section, of a keyboard incorporating keys embodying the invention;

FIG. 2 is a perspective view of a key on a larger scale;

FIG. 3 is a median section of the key of FIG. 2;

FIG. 4 is a median section of the key of FIG. 2 in the depressed position;

FIG. 5 is a section on the line V—V of FIG. 3;

FIG. 6 is a median section of a variant of the key on an enlarged scale;

FIG. 7 is a section on the line VII—VII of FIG. 6.

## DETAILED DESCRIPTION OF THE INVENTION

The keyboard of FIG. 1 is of the alphabetic type and includes a hold cover plate 11 below which there is fixed a thick plastic plate 12 formed by injection moulding with a series of openings 13 which are disposed in various rows and are each adapted to receive a printing key 14 or other function keys 15. Below the plate 12 there is fixed a flat body or plate 16 (FIG. 3) of insulating material on which a printed circuit is arranged. The printed circuit comprises for each key 14, 15 a pair of fixed electric contacts constituted by a pair of terminal areas 17 and 18 (FIG. 1) connected to two corresponding conductors 19 and 20 of an encoding circuit.

Each key 14 (FIG. 2) or 15 includes a hollow head 21 which is retained removably, by the interaction of two semi-cylindrical projections 22 on head 21 and two pairs of V-shaped notches 23 formed in the shank 24 of the key. The shank 24 is formed of a block of insulating plastic material. The shank 24 is provided with a deep recess 25 which provides a resilient action that permits the head 21 of the key 14, 15 to be snapped into place or removed.

The shank 24 moreover carries two lateral vertical ribs 26 (FIG. 5) on which there are formed two raised portions 27 and 28 (FIG. 2) by means of which the shank 24 can slide in two prismatic guides 29 (FIG. 5) formed in the plate 12. The shank 24 (FIG. 3) is provided at the bottom with two surfaces 31 and 32 adapted to co-operate with two pairs of hemispherical protuberances 33 and 34 (FIG. 5) of a plate 36 of insulating material. This plate 36 has at one end a central extension 37 having an edge 38 (FIG. 3) bent substantially in the form of a cylindrical sector. The edge 38 is adapted to roll on a plane vertical surface 39 of a rib 40 formed in each opening in the plate 12.

The extension 37 of the plate 36 is provided with a hook element or tooth 46 adapted to co-operate with a shoulder 47 of the rib 40.

A spring 41 is stretched between a point of the plate 36 intermediate between the pairs of protuberances 33 and 34 and a bracket or ledge 42 formed integrally in each opening 13 in the plate 12. The spring 41 urges the plate 36 in a horizontal direction with the edge 38 of the extension 37 against the surface 39 and in a vertical direction with the protuberances 33 and 34 against the surfaces 31 and 32, respectively. The shank 24 is moreover urged upwardly by the spring 41 and bears by means of a shoulder 43 against another ledge 44 formed integrally in each opening 13 in the plate 12.

Fixed to the plate 36 is a movable electric contact constituted by a strip 48 of conducting material fixed to the bottom of the plate 36 substantially in correspondence with the point of attachment of the spring 41. The strip 48 includes two leaf-like tongues 49 (FIG. 5) terminating in a backwardly curved portion 50 on the two sides of the extension 37. The backwardly curved portion 50 is formed in such manner as to project considerably with respect to the bottom surface of the edge 38. These backwardly curved portions 50 are adapted to co-operate with the areas 17 and 18 (FIG. 1) of the corresponding conductors 19 and 20 of the printed circuit of the plate 16.

The shank 24 (FIG. 3) is lastly provided with a flexible extension 51 which is directed upwardly and normally bears against a projection 52 of the head 21 of

the key 14, 15. The extension 51 has a tooth 53 adapted to co-operate with two surfaces 54 and 55 of the ledge 44. The surface 54 is substantially horizontal, while the surface 55 is inclined downwardly.

The key 14, 15 of FIGS. 2 to 5 operates in the following manner.

Upon depressing a key 14, 15, the two surfaces 31 and 32 press against the protuberances 33 and 34 to cause the spring 41 to be stretched and shift the plate 36 downwardly until the tooth 46 is brought into contact with the shoulder 47. The stroke of the key 14, 15 continues with the tooth 46 arrested, the edge 38 rolling on the surface 39. The protuberances 34 now begin to roll on the surface 32, as a result of which the plate 36 turns anticlockwise, while the protuberances 33 move away from the surface 31. The tooth 46, in turn, moves to the left as the plate 36 rotates about surface 39 until, when the plate 36 reaches the position shown in dashes in FIG. 3, tooth 46 disengages from the shoulder 47.

The spring 41 now causes the plate 36 to turn clockwise, causing the protuberances 34 to roll on the surface 32 until the protuberances 33 are arrested against the surface. The plate 36 then continues its movement through inertia, causing the protuberances 33 to roll on the surface 31 and moving the protuberances 34 away from the surface 32. The backwardly curved portions 50 of the tongues 49 now strike against the areas 17 and 18 (FIG. 1) of the two conductors 19 and 20, closing the encoding circuit corresponding to the key 14, 15 that has been depressed.

Immediately afterwards, the plate 36 (FIG. 3) rebounds, being brought back so that protuberances 34 are also against the surface 32, as shown in solid lines in FIG. 4, in which the tongues 49 are separated from the areas 17 and 18 (FIG. 1). In this way, a signal of brief duration is supplied, even if the key 14, 15 is kept depressed. Upon release the key 14, 15 is brought back into the initial position through the action of the spring 41 (FIG. 3).

If it should be necessary to supply a continuous signal on the conductors 19 and 20 of a key 14, 15, for example in order to obtain repetition of a character, the key 14, 15 is pressed further downwardly from the position shown in solid lines in FIG. 4. The tooth 53, being forced against the surface 54, then causes the extension 51 to bend to the right until the tooth 53 slides on the surface 55. The two surfaces 31 and 32, acting on the plate 36, bring plate 36 into the position shown in dashes in FIG. 4, in which the two tongues 50 touch the areas 17 and 18 of the corresponding conductors. The signal is thus maintained continuously as long as the key 14, 15 is kept depressed.

According to a variant of the invention, the key 14, 15 is provided with a head 56 (FIG. 6) having a slot 57 by means of which the head 56 is fixed removably in frictional engagement to an extension 58 of a shank 59 of the key 14, 15, which is formed of insulating material. The shank 59 includes two arms 60 mounted slidably in a cavity 61 in a corresponding guide block 62. The various guide blocks 62 are fixed to the holed cover plate 11 of the keyboard. Each block 62 projects at the top of the plate 11 through an opening 63 and bears against the plate 11 by means of two shoulders 67 and 68. The block 62 is held fixed by a wire 64, which is

passed through an opening formed through all the blocks 62 of a row of keys 14, 15. This opening is defined at the top by a shoulder 65 of a bracket 66 of the block 62 itself and at the bottom by the plate 11. The distance between the shoulder 65 and the plate 11 is substantially equal to the diameter of the wire 64. Wire 64 is prevented from emerging laterally on the one hand by a projection 69 of the bracket 66 and, on the other hand, by two projections 71 of the block 62 itself.

In the block 62 (FIG. 7) there is formed on one side a first prismatic guide constituted by a vertical slot 72 of L-shaped section and, on the opposite side, by a second prismatic guide constituted by a vertical slot 73 of rectangular section. In the two slots 72 and 73 there can slide two vertical ribs 74 and 75 integral with the shank 59 and having sections corresponding substantially to the slots 72 and 73 themselves. A clearance provided between the rib 75 and the base of the slot 73 enables any possible thermal expansion of the shank 59 to be accommodated.

The arms 60 of the shank 59 (FIG. 6) are connected by a bottom crosspiece 76 having two bottom surfaces 77 and 78 adapted to co-operate with the protuberances 33 and 34 of the plate 36 carrying the contact strip 48. The edge 38 of the extension 37 co-operates with a vertical surface 79 of a rib 80 formed in the cavity 61 of the block 62. The spring 41 is stretched between the plate 36 and the bracket 66 and holds the key 14, 15 so that it bears against a shoulder 81 of a bracket or ledge 82 in a similar manner to that in the first embodiment. The crosspiece 76 is provided with a flexible arm 83 which is directed upwardly and is provided with a tooth 84 adapted to be arrested against a horizontal surface 85 of the bracket 82.

The operation of the key 14, 15 of FIGS. 6 and 7 is absolutely identical to that of the key 14, 15 of FIGS. 2 to 5 and does not require further explanation.

If it is not required that the signal associated with a key 14, 15 be repeated, the head 56 of the key 14, 15 is provided with a rigid extension 86 (FIG. 6) adapted to prevent bending of the arm 83 and, therefore, any further downward travel of the key 14, 15 beyond the position defined by the arrest of the tooth 84 against the surface 85.

It is understood that various modifications, improvements and additions of parts may be made in the key described without departing from the scope of the invention.

I claim:

1. A key for keyboards of electric-input devices, including a head and a shank for operating at least one movable electric contact to close a circuit by bearing on a fixed electric contact, wherein the improvement comprises:

an insulating plate carrying said movable electric contact,

a spring normally holding said plate so that it bears against said shank in at least two different bearing points, said bearing points being situated on opposite sides of the point of attachment of said spring to said plate,

hook means carried by said plate,

fixed means engageable by said hook means during the depression stroke of the key, said hook means

during engagement with said fixed means first causing said plate to turn about one of said two bearing points and then causing said plate to disengage said hook means from said fixed means, whereby said spring suddenly moves said plate and said movable contact to touch said fixed contact temporarily through inertia, said spring then returning said plate to contact both said bearing points, and

stop means to stop said shank in such a position as to cause said movable contact to be separated from said fixed contact when said key is held depressed, as a result of which a single electric signal in the form of a pulse is generated.

2. A key according to claim 1 further comprising:

a stop surface in said stop means for defining the stroke of a key,

a tooth secured to said shank to cooperate with said stop surface,

a cam surface, and

a flexible extension of said shank carrying said tooth and cooperating with said cam surface to remove said tooth upon depressing the key for a stroke greater than said defined stroke so as to hold said movable contact in contact with said fixed contact as long as the key is kept depressed for said greater stroke in order to supply a continuous electric signal.

3. A key according to claim 1, wherein said hook means comprise:

a hook element, and

a cam extension integral with said plate and carrying said hook element;

and wherein said fixed means comprise: a shoulder engageable by said hook element, and a fixed support normally contacted by said cam extension under the urging of said spring to cam said cam extension upon engagement of said hook element during said depression so as to disengage said hook element from said shoulder.

4. A key according to claim 1, wherein said movable contact is constituted by a pair of leaves fixed with one end substantially in correspondence with said point of attachment and directed towards said extension, said fixed contact being constituted by the ends of a pair of conductors of a printed circuit.

5. A key according to claim 1, wherein said shank is slidable in a prismatic guide, said bearing points being disposed on that end of the shank which is remote from the head of the key.

6. A key according to claim 5, wherein said fixed support comprises a surface parallel to said prismatic guide, and said extension includes a rounded surface cooperating with said support, said shoulder being perpendicular to said prismatic guide.

7. A key according to claim 6, wherein said shank and said prismatic guide are made of plastic, said prismatic guide comprising a portion of L-shaped section and a portion constituted by two parallel walls.

8. A key according to claim 6, comprising:

two opposite prismatic notches on said shank, a head of the key also made of plastic material and mounted removably thereon,

two semi-cylindrical projections provided internally on said head to engage said notches, and a recess arranged in said shank between said notches to enable said notches to be brought nearer to each other for removing or mounting the head.

9. A keyboard for an electric-input device comprising a set of different keys, each said key including a shank for operating at least one movable electric contact to close a circuit by bearing on a corresponding fixed electric contact, said fixed contact being carried by a fixed flat body, wherein the improvement comprises:

a set of insulating plates associated with said keys and each one carrying the corresponding said movable electric contact,

a set of springs associated with said plates and each said spring normally holding the associated said plate so that said plate bears against said shank of the associated key in at least two different points, said points being situated on opposite sides of the point of attachment of said spring to said plate,

hook means connected to each one of said plates,

fixed means engaged by said hook means during the depression stroke of the associated key, said hook means during engagement with said fixed means first causing the associated plate to turn about one of said two points, and then causing the associated plate to disengage said hook means from said fixed means, whereby said spring suddenly moves said plate and said movable contact to touch said fixed contact temporarily through inertia, said spring then returning said plate to contact both said different points,

stop means for stopping said shank in such a position as to cause the associated movable contact to be separated from the fixed contact when the key is held depressed, as a result of which a single electric signal in the form of a pulse is generated,

a guide block for each one of said shanks secured to said flat body, each one of said guide blocks having an internal opening for receiving said shank, and

a holed plate parallel to said flat body for engaging said guide blocks with said shank protruding outwardly therethrough.

10. A keyboard according to claim 9 further comprising:

a stop surface comprised in said stop means for defining the stroke of each one of said keys,

a tooth secured to each one of said shanks to cooperate with said stop surface,

a stationary cam surface,

a flexible extension of each one of said shanks carrying said tooth and cooperating with the associated cam surface to be bent thus removing said tooth upon depressing the associated key for a stroke greater than said defined stroke so as to hold the associated movable contact in contact with the associated fixed contact as long as the associated key is kept depressed for said greater stroke in order to supply a continuous electric signal, and

a rigid extension associated with some of said keys to prevent bending of said flexible extension.

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