

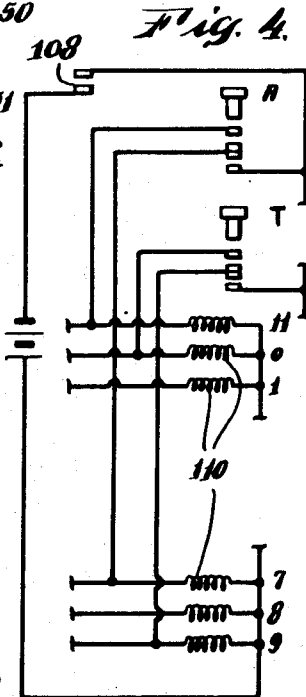
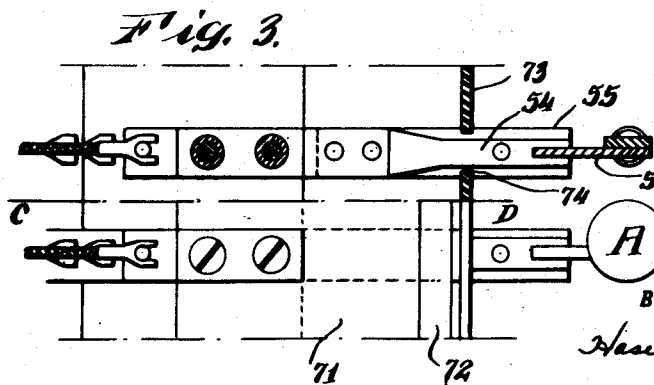
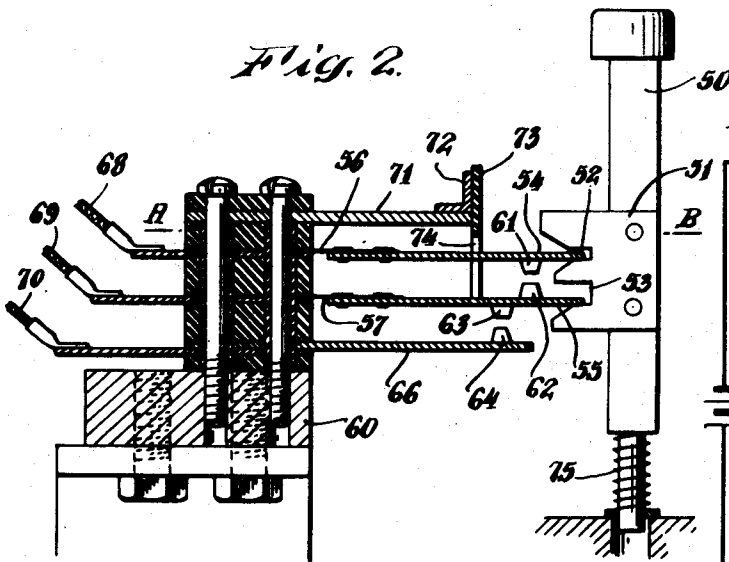
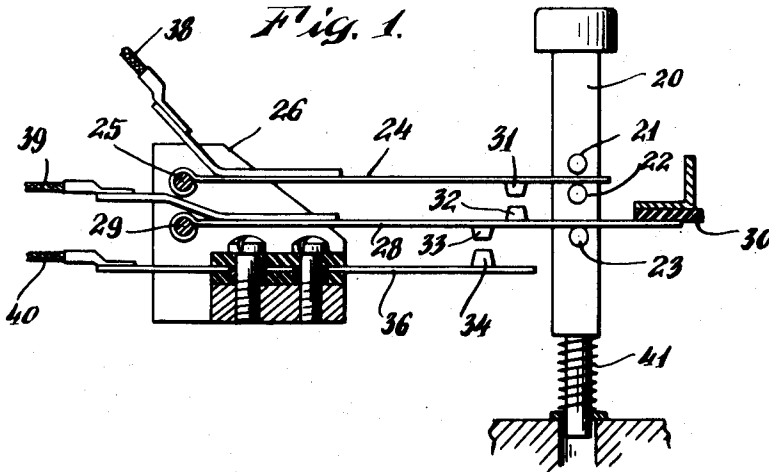
Sept. 26, 1950

K. A. KNUTSEN
KEYBOARD FOR ELECTRICALLY CONTROLLED
ACCOUNTING OR CARD PUNCHING MACHINES

2,523,768

Filed Sept. 6, 1946

2 Sheets-Sheet 1



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2 Sheets-Sheet 2

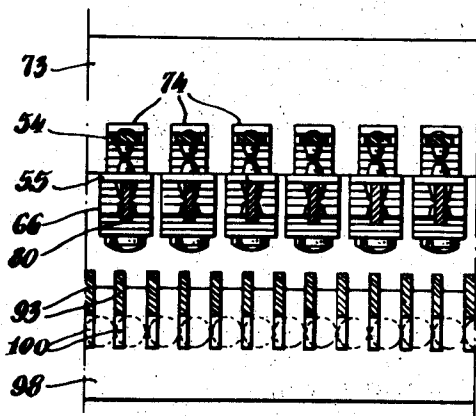
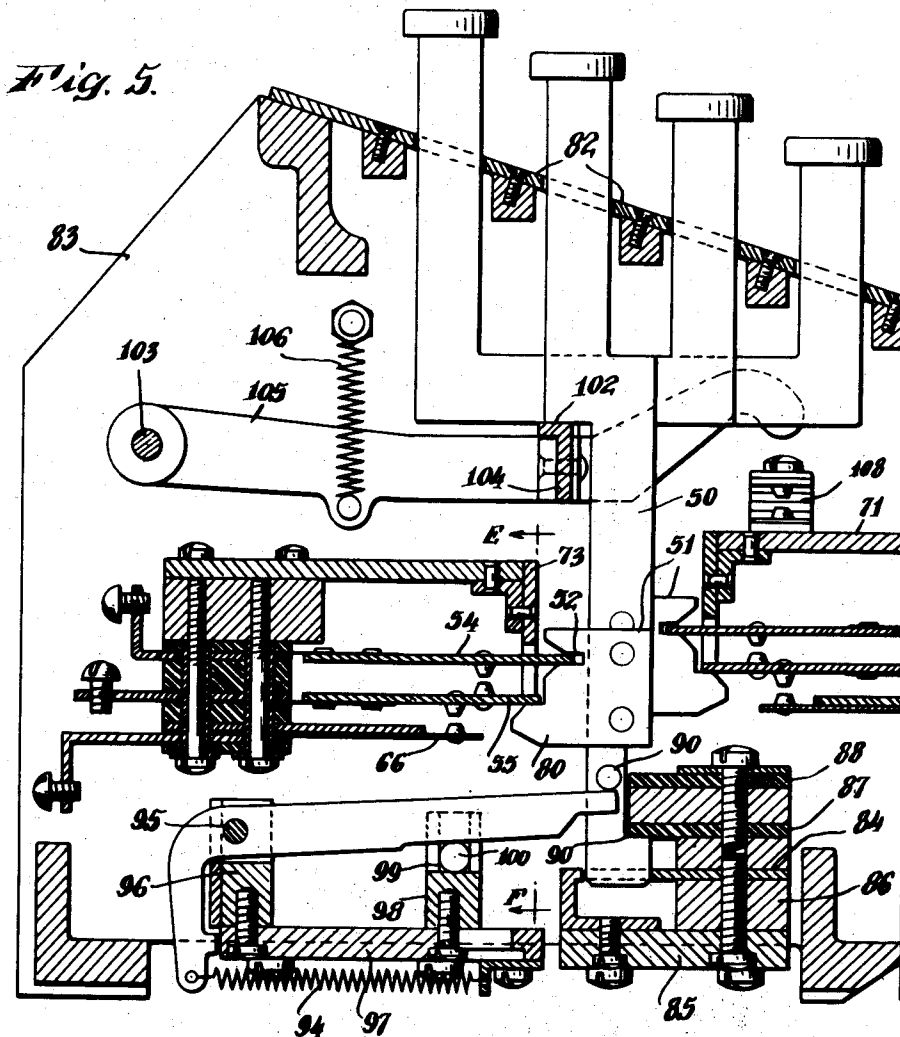


Fig. 6.

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KEYBOARD FOR ELECTRICALLY CONTROLLED ACCOUNTING OR CARD PUNCHING MACHINES

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4 Claims. (Cl. 200—5)

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The present invention relates to improvements in electrical keyboards, especially in electrical keyboards for accounting machines and perforated card controlled machines. In these keyboards the depression of a key controls the closing of one or a plurality of contacts, thus establishing one or a plurality of determined circuits.

In some of these keyboards it is usual to utilize a key blocking device, comprising a row of balls, to insure that only a single key may be actuated at a time, all the other keys being blocked. In existing keyboards the operation of this key blocking device involves a certain resistance to the depression of a key.

It is convenient that the depression of the keys should require a very small effort, i. e., that the keyboard should be as smooth as possible. When the depression of a key has to control the closing of a plurality of contacts, for example in an alphabetical keyboard for a card punching machine, said depression generally requires a certain effort as the resistance of a plurality of spring blades has to be overcome. To obtain a smooth keyboard it is further important that the resistance opposed by an eventual key blocking device may be as small as possible.

An object of the invention is to provide a keyboard in which the depression of a key closes a plurality of contacts comprising multiple contact blades, one single of said contact blades insuring the contact pressure for all contacts, the other blades being articulated at their attached end to offer a negligible resistance to the depression of said key compared with the resistance of said single contact blade.

According to the invention, the other blades which oppose a very little resistance, if any, to the depression of the key, are restored to their initial position by the key, when said key is restored to its initial position under the control of its restoring spring.

Another object of the invention is to provide a keyboard in which the resistance opposed by the key blocking device is reduced to a minimum by effecting the necessary spacing of the balls by means of a lever actuated by the key, all or nearly all the rectilinear depression movement of the key being utilized to operate said spacing, due to a proper demultiplication of movements.

Other characteristics in various realizations of the present invention will appear in the following description by inspection of the accompanying drawings, which show by way of example, different modes of realization of the invention.

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In the drawings:

Fig. 1 is a diagrammatic section showing a key and the electric contacts actuated by said key according to a first realization of the invention.

Fig. 2 is a diagrammatic section showing a key and the electric contacts actuated by said key according to another form of realization of the invention.

Fig. 3 shows, above line CD, a horizontal section on line AB of Figure 2, and below line CD, a top plan view of Figure 2.

Fig. 4 shows diagrammatically the electric connections of some contacts of an alphabetical keyboard.

Fig. 5 is a part section of an electric alphabetical keyboard.

Fig. 6 is a vertical section on line E, F, of Fig. 5.

In the mode of execution shown in Fig. 1, the key is provided with a vertical rod bearing three pins 21 to 23 in insulating material. Between pins 21 and 22 is engaged the free end of the rigid upper blade 24 which is freely pivoted on hinge 25, the axle of which is fixed in the insulating support 26. Above pin 23 is located the rigid middle blade 28 which is freely pivoted on hinge 29, the axle of which is fixed in the insulating support 26. On the upper blade 24 is riveted a contact segment 31, and on the middle blade are riveted two contact segments 32 and 33. Contact segment 33 is adapted to make contact with a contact segment 34 fixed to the lower resilient blade 36, said blade being fixed to the insulating support 26. Blades 24, 28 and 36 are connected to wires 38, 39 and 40.

When the key is depressed against action of spring 41, the blade 24 engaged between pins 21 and 22 and the blade 28 resting on pin 23 pivot respectively on hinges 25 and 28 without encountering any appreciable frictional resistance. During the downward movement of the blades, contact points 31—33 come respectively into contact with contact points 32—34 as a result of the resilient resistance of the lower blade conjugated with the force exerted on the upper blade 24 by the key. It is clear that blade 36 is the only one to offer a resistance sufficient to insure the contact of all the contact points between itself and the uppermost blade. When the key rises again, under action of its spring 41, blades 24 and 28 are restored to their initial position by pins 22 and 23. The rise of blade 28 and thus of the key is limited by the abutment 30.

Figures 2 and 3 show another form of realization of the invention. On the vertical rod 50 of each key Fig. 2, of a keyboard, is riveted an in-

insulating plate 51 provided with two notches 52, 53. In the upper notch 52 is engaged the free end of the upper blade 54. In the lower notch 53 is engaged the free end of the middle blade 55. It is to be noticed that notch 53 is larger than notch 52, so as to allow a certain movement of key 50 before blade 55 is actuated. Blades 54, 55 are rigid and respectively riveted on thin blades 56, 57 of a flexibility such that they may be curved by a slight bending force such as the weight of blade 54 or 55. Blades 56, 57 are fixed on a support 60, but electrically insulated from this support.

On the upper blade is riveted a contact segment 61 and on the middle blade are riveted two contact segments 62 and 63. Segment 63 is adapted to come into contact with a contact segment 64 fixed on a lower resilient blade 66 which is fixed on support 60, but electrically insulated from it. The blades are connected to wires 68, 69 and 70.

On support 60 is further fixed a plate 71 on which, by a bracket 72 is fixed a vertical plate 73 made of insulating material, provided with notches 74, one for each key. In each notch 74 is engaged the reduced portion of an upper blade 54, the width of which is reduced, Figs. 2 and 3, and the width of said notches is such that a middle blade 55 which has no reduced portion abuts normally against the lower edge of plate 73.

When a key is depressed against action of its spring 75, the upper blade 54 engaged in notch 52 and the middle blade 55 resting on the notch 53 are moved downwards and during this movement of blades the contact points 61, 63 come respectively into contact with the contact points 62, 64 as a consequence of the resilient resistance offered by the lower blade 66.

From the foregoing, it is clear that the resilience of blades 56, 57 is only a very small part of that of the lower blade 66, and that said blade 66 is the only one to offer a resistance sufficient to insure the contact of all the contact points between itself and the uppermost blade.

When the key is raised under the action of its spring 75, blades 54 and 55 are restored to their initial position by the insulating plate 51. The middle blade 55 abuts against the lower edge of plate 73, so that the upward movement of key 50 is limited, and segment 62 is prevented from adhering with segment 61.

Fig. 5 shows a part section of a keyboard adapted according to the invention to be utilized as an alphabetical keyboard for the control of a card punching machine. The construction of the contacts being the same as described for contacts of Figs. 2 and 3, it is deemed unnecessary to describe said contacts again, and the same reference numbers are used to designate similar members. Moreover, the description of the keyboard members not directly concerning the invention, is made hereafter briefly.

To the vertical rod 50 of each key Fig. 5, is fixed an insulating plate 51 the shape of which is slightly different from the shape shown in Fig. 2. The middle blade 55 rests normally with its free end on the horizontal part of a projection 80 of plate 51 while the upper blade 54 is engaged in a notch 52 of said plate as hereinabove described.

Fig. 6 shows the position normally occupied by contact blades 54, 55 and 66, with respect to the vertical plate 73, provided with notches 74, as hereinabove described.

The vertical rod of each key is guided in its

upper part by the combs 82 fixed to the side plates 83 of the frame, and in its lower part by the comb 84 fixed by means of the cross-bar 86 to the support 85 fixed itself to said side plates. To the support 85 are also fixed two plates 87, 88 of yielding material. Against plate 87 bears normally a shoulder 90 of each vertical rod 50. Plate 88 serves as an abutment for plate 51 when a key is depressed.

Each vertical rod 50 carries a pin 92 against which bears the end of the horizontal arm of a two armed lever 93 urged by a spring 94 counter-clockwise about an axle 95 fixed in a comb 96 fixed itself to a support 97 fixed to side plates 83. To the support 97 is also fixed a member 98 provided on its whole length with a slot 99 containing a row of balls 100, Figs. 5 and 6. The two sides of slot 99 are provided with notches in which levers 93 are guided.

Support 97 is fixed in such a position that when a key is in its upper position, the lower edge of the corresponding lever 93 lies close to balls 100. When a key is fully depressed, the lower edge of the corresponding lever 93, comes into a position slightly beneath the center of balls 100 after having spaced the balls a distance equal to the thickness of lever 93. Thus as soon as the depression of the key begins, the spacing of the balls begins and the complete movement of the key is utilized to cause the necessary spacing of the balls. On account of the lever arm between axle 95 and ball 100 being smaller than the lever arm between axle 95 and pin 92, the resulting demultiplication of the movement makes the depression of a key as smooth as possible.

Each vertical rod is further provided with a shoulder 102 against which bears the bail 104 fixed at each end to a lever 105 adapted to rock on the fixed axle 103 and biased upwards by a spring 106. To the bail 104 is fixed an arm 107 adapted to cooperate with a contact 108 normally open and fixed to plate 71. Whenever a key is depressed, the bail 104 is rocked and when the key reaches the end of its movement, the arm 107 closes contact 108.

The electric connections of the above mentioned contacts will be well understood with reference to Fig. 4 which shows the connections for two sets of contacts controlled by two keys of an alphabetical keyboard.

This diagram shows, for example, that whenever a key A or T is depressed and contact 108 is closed, two corresponding magnets 110 are energized and control the operation of the punching machine in a known manner.

It is to be observed that Figs. 1, 2, 4, 5 show only by way of example a mode of realization in which three contact blades are incorporated. The switch could comprise more than three blades and the advantage called for in the invention should be the more sensible as there should be more contact blades, without exceeding a reasonable number of blades.

While I have described what I deem to be practical and efficient embodiments of my invention, it should be well understood that I do not wish to be limited thereto, as there might be changes made in the arrangement, disposition and form of the parts, without departing from the principle of my invention, as comprehended within the scope of the appended claims.

What I claim is:

1. In an electrically controlled accounting machine in which a plurality of circuits is to be completed upon depression of a key, a keyboard

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comprising a set of electrical contact blades operated by a mechanically related key, said set including a lower resilient blade with a contact segment, a plurality of blades bearing contact segments and located above said lower blade, said plurality of blades being attached to an insulating block by means of individual hinges, means comprising an insulating member movable with said key for positive actuation of the upper blade in two directions and for positive actuation of the intermediate blades in one direction for closing and breaking circuits controlled by said contact segments at each complete stroke of said key.

2. In an electrically controlled punching machine in which a plurality of circuits is to be closed upon depression of a key, a keyboard comprising a key adjacent to a set of electric contact blades, provided with contact points, said set including an upper and intermediate blades flexibly articulated at their attached end, a lower resilient blade of a stiffness sufficient to insure the contact of all the contact points between itself and the upper blade, said key bearing a member of insulating material engaging all the contact blades except the lower one for bringing all the contact points into contact when said key is depressed.

3. In an electrically controlled registering machine in which a plurality of circuits is to be closed upon depression of a key, a keyboard comprising a key adjacent to a set of electric contact blades, said set including an upper and intermediate blades flexibly articulated at their attached end, a lower resilient blade, said key bearing members of insulating material engaging two faces of the upper blade and one face of the intermediate blades for opening positively its related circuits by means of said insulating members adapted to space all the associated contact blades from each other when said key is restored to its normal position.

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4. In an electrically controlled machine of the class described, in which several circuits are to be concurrently closed by one manual command, a keyboard comprising a series of keys ended by keystems arranged in a row and a key blocking device for permitting only one key to be depressed at a time, each of said keys being adjacent to a set of electric contact blades including an upper and intermediate blades flexibly articulated at their attached end and a lower resilient blade, said key bearing a member of insulating material engaging all the contact blades except the lower one, said key blocking device comprising a series of spacing levers associated each with a key, a row of balls in which the possible interval between two adjacent balls is limited, each of said spacing levers being adapted to oscillate on a rocking axle parallel to said row of balls and to said row of keystems, spacing the balls of a distance sensibly equal to the thickness of said lever when a related key is depressed, the lever arm between the row of balls and the rocking axle of said spacing lever being shorter than the lever arm between said rocking axle and the row of keystems, so as to reduce the effort for depressing said key.

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