Feb. 21, 1956 G. MEYER 2,735,532

APPARATUS FOR CONTROLLING KEYS OF BUSINESS MACHINES

Filed Sept. 30, 1954

Fig. 1

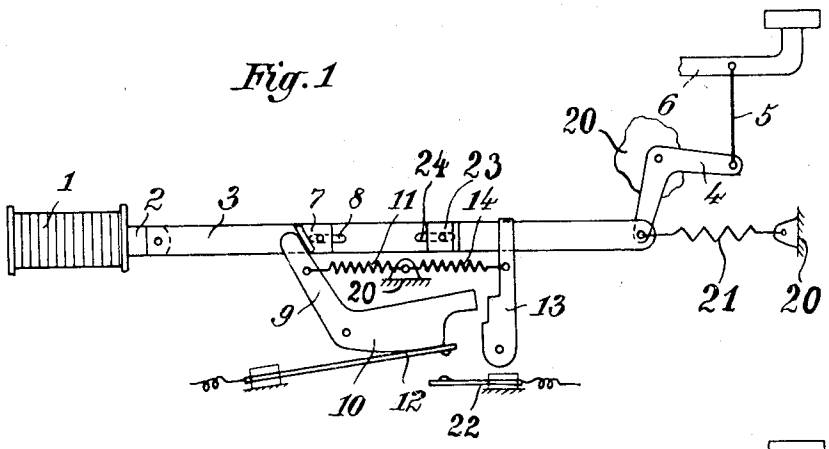


Fig. 2

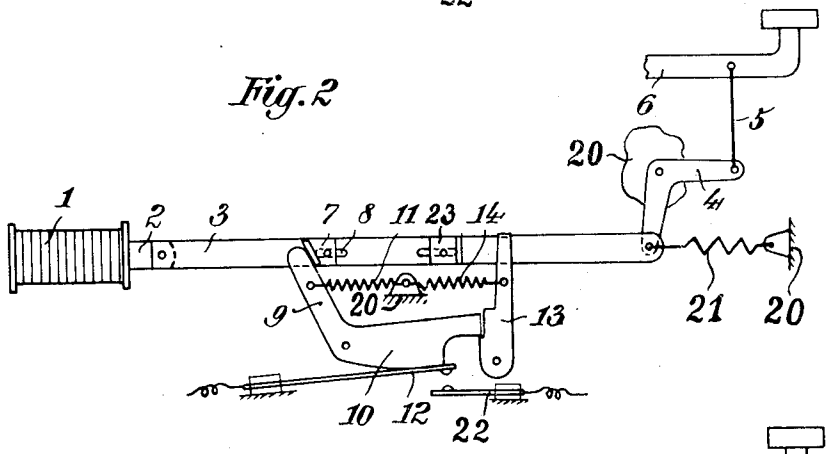
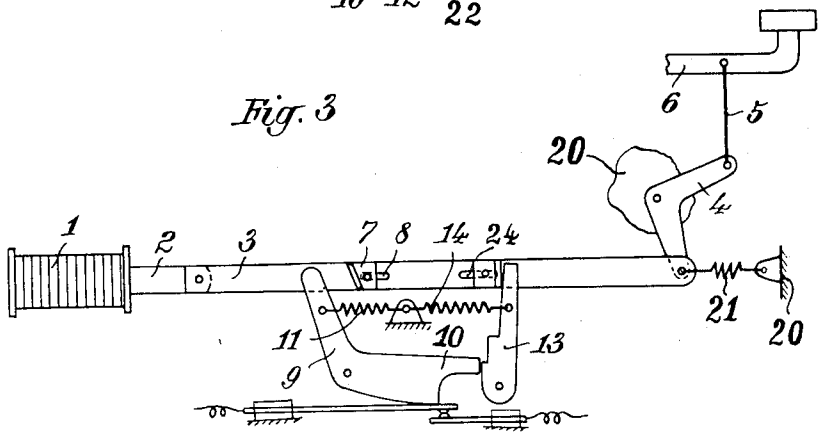


Fig. 3



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2,735,532

Patented Feb. 21, 1956

2,735,532

APPARATUS FOR CONTROLLING KEYS OF BUSINESS MACHINES

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Application September 30, 1954, Serial No. 459,376

4 Claims. (Cl. 197—19)

The present invention relates to business machines such as typewriters, accounting machines, calculating machines, etc., and in particular to machines of this type whose keys may be operated electrically.

With machines of this type electrical impulses are transmitted in accordance with certain signals to the machine and the paper carriage thereof moves into position to permit a sheet of paper carried thereby to receive the imprint of a particular type member, this operation taking place automatically upon energizing of certain solenoids by an electrical system which transmits the signals. Inasmuch as the movement of the paper carriage under such circumstances is very short and inasmuch as the switches which control the circuits move very quickly, much more quickly than the time required by the type actuating mechanism to move a type carrying member against the paper and back again to its starting position, it is essential to provide a control switch which interrupts the flow of current to the solenoids which actuate the type keys as soon as the latter have been actuated, and, in fact, practically a short period of time before actuation of the typing key and this switch should be closed only when the typing mechanism is back in its starting position. In other words, operation of the typing keys of machines of the above type requires so much more time than operation of the other parts of the machine, such as movement of the carriage thereof, that it is essential to provide a means which will guarantee that the solenoids which actuate the type members and the typing keys therewith are energized for an extremely short period of time and which guarantees that the circuit to the solenoids will not again be in a position for energizing the solenoids until the typing mechanisms return to their starting position.

There have already been attempts to solve the above problem, and among the known solutions is, for example, a freely turnable switch operating member which may stop in any one of a number of different positions so that the time required for operating the switch varies depending upon the particular position in which this switch operated member happens to be.

It is an object of the present invention to overcome the above drawbacks by providing a structure of the above type with a switch operating member which is always in a predetermined position at the start and end of a cycle of operation.

Another object of the present invention is to provide a switch operating member of the above type with a means for moving this switch operating member positively and quickly back to its starting position.

Furthermore, it is an object of the present invention to provide a structure of the above type with an adjustable setting which is capable of controlling the moments at which the switch is opened and closed.

In addition, it is an object of the present invention to provide structure capable of accomplishing the above objects and at the same time being made up of simple

and ruggedly constructed parts which are very reliable in operation.

With the above objects in view, the present invention mainly consists of an electrically operable business machine which includes an operating key and a linkage means operatively connected to the key. A solenoid is operatively connected to the linkage means for actuating the key through the linkage means when the solenoid is energized. A switch is located in the circuit of the solenoid, and a switch operating means operatively engages the switch and linkage means for opening the switch upon movement of the linkage means when the solenoid is energized and for closing the switch upon return of the linkage means and key to their starting position after de-energizing of the solenoid upon opening of the switch. A means engages the switch operating means to locate the same in a first predetermined position upon opening of the switch and in a second predetermined position upon closing of the switch.

The novel features which are considered as characteristic for the invention are set forth in particular in the appended claims. The invention itself, however, both as to its construction and its method of operation, together with additional objects and advantages thereof, will be best understood from the following description of specific embodiments when read in connection with the accompanying drawings, in which:

Fig. 1 is a fragmentary, partly schematic elevational view of the structure associated with one operating key, this structure being shown in the position where a switch in the circuit of the key actuating solenoid has just been opened;

Fig. 2 illustrates the structure of Fig. 1 immediately after the time when the parts have the position shown in Fig. 1, in the position the parts take while the switch is maintained open; and

Fig. 3 illustrates the position of the parts of Figs. 1 and 2 at the end of one cycle and at the start of the next cycle, that is, when the switch in the circuit of the solenoid is closed.

Referring now to the drawings, it will be seen that the structure of the invention includes a support means **20**, parts of which are diagrammatically indicated in the drawings, this support means supporting all of the parts shown in the drawings. A solenoid which includes a coil **1** and armature **2** is connected at the armature **2** thereof to a linkage means which includes an elongated bar **3** connected at its left end, as viewed in the drawings, to the armature **2** and at its right end to a bell crank lever **4** and to a spring **21** which urges the linkage means to its starting position shown in Fig. 3, any suitable stop being provided to properly locate the parts in the rest position shown in Fig. 3. The bell crank **4** in addition to being pivotally connected to member **3** and to the support means **20** is pivotally connected to a link **5** which is in turn pivotally connected to an operating key **6**, this operating key **6** actuating any known typing mechanism for typing a given character on a sheet of paper carried by the carriage of the particular machine. Thus, the elements **3—5** form a linkage means interconnecting the solenoid **1, 2** with the operating key **6**, and this latter key is actuated upon energizing of the solenoid through this linkage means.

Electrical signals are transmitted by any suitable known transmitter to energize the solenoid in a known way not forming part of the present invention. For example, teletype machines and the like are commonly actuated in this manner. A switch **22** is located in the circuit of the solenoid **1, 2** and this switch **22** includes a springy contact arm **12** which by its own resiliency tends to move upwardly from the position shown in Fig. 3 to that of Fig. 1.

A bell crank lever **9, 10** is pivotally carried by the sup-

port means 20, and the arm 10 thereof engages the contact member 12 while the arm 9 extends alongside of element 3 of the linkage means. A fairly strong spring 11 is connected at one end to arm 9 and at its opposite end to support means 20 for urging lever 9, 10 in a clockwise direction, as viewed in the drawings, to the position of Fig. 3.

An angle member 7 forms that part of the linkage means which engages arm 9 to transmit movement of the linkage means to the switch operating member 9, 10. The member 3 is formed with an elongated slot 8, and a threaded pin extends from one leg of member 7 through the slot 8. A nut engages this threaded pin on the side of member 3 opposite that shown in the drawings so that after loosening of this nut the position of member 7 along member 3 may be adjusted within the limits of slot 8, and the nut may then be tightened to maintain the member 7 in its adjusted position. The angle member 7 has a leg extending laterally from the member 3 to engage the arm 9 adjacent its top end portion, as viewed in the drawings.

A catch member 13 is pivotally mounted adjacent its bottom end, as viewed in the drawings, on the support means 20 and is urged by a relatively light spring 14, which is much weaker than spring 11, in a counterclockwise direction, as viewed in the drawings. As is evident from the drawings, the left edge of member 13, as viewed in the drawings, is stepped so that a shoulder is provided to move beneath the right free end portion of arm 10 to prevent downward movement of the latter. The spring 14 is connected at one end to catch 13 and at its opposite end to the support means 20.

A second angle member 23 is connected to the member 3 for controlling the catch 13. This angle member 23 has connected thereto a threaded pin extending through a slot 24 for adjustably fixing the position of angle member 23 on the member 3 in the same way that the position of angle member 7 is fixed. This angle member 23 has, in addition to its leg which engages and is located alongside of element 3, a leg extending laterally from member 3 to engage the catch 13 adjacent its top end portion.

The above-described structure operates as follows:

Fig. 3 shows the parts in their starting position. Assuming now that a signal has been transmitted to the machine and energizes the solenoid, the coil 1 will pull the armature 2 to the left, as viewed in the drawings, from the position of Fig. 3 to that of Fig. 1. This movement will cause the member 7 to engage the switch operating member 9, 10 and turn the latter in a counterclockwise direction, as viewed in the drawings, against the action of spring 11, so that arm 10 moves upwardly and contact member 12 through its own resiliency also moves upwardly and opens the switch 22 which is in the circuit of the solenoid. Thus, energizing of the solenoid actuates the key 6 and the typing mechanism operated thereby through the linkage 3—5, and at the same time element 7 actuates lever 9, 10 to open the circuit to the solenoid an instant after the solenoid is energized. This is the position which the parts have in Fig. 1.

The solenoid being de-energized, the spring 21 is free to return the parts to their starting position. Thus, the structure starts to move from the position of Fig. 1 back to that of Fig. 3 and the member 7 moves to the right, as viewed in the drawings, to release lever 9, 10 to the action of spring 11. However, at the instant when the solenoid was energized the spring 14 turned the catch 13 to a position where a shoulder thereof is located in the path of movement of the right free end of arm 10, as viewed in the drawings, so that upon return of the parts toward the position of Fig. 3 the catch 13 engages arm 10 to prevent movement of lever 9, 10 back to its starting position even after member 7 moves to the right, as viewed in the drawings, beyond arm 9. The parts are retained in this position, shown in Fig. 2, until member 23 engages the catch 13 to turn the latter in a clockwise direction against the influence of spring 14 so as to release the lever 9, 10 to the influence of spring 11. It will be noted that element 23 is positioned to engage member 13 only at the instant before the parts are back in their starting position so that the switch 22 is maintained open by catch 13 during the period that the parts return to their starting position. It is only just before the end of the movement of the parts back to their starting position that the catch 13 is turned by element 23 away from lever 9, 10 to permit spring 11 to turn this lever to cause the latter to move contact 12 back to its closing position.

Thus, it will be noted that with the structure of the invention a positive opening and closing of the switch is assured at predetermined positions of movement of the typing mechanism. The switch operating lever 9, 10 cannot assume any position intermediate its switch opening and switch closing positions; it is either raised and held in its raised position by the catch 13 or it is under the influence of the strong spring 11 to positively hold the switch 22 closed. This latter feature of providing a definite positive force maintaining the switch 22 closed is of great significance for the proper operation of the machine because of the relatively low potential under which the machine operates. Furthermore, a particular advantage of the disclosed mechanism resides in the fact that a very light spring is used to operate the catch 13, so that the spring 21 may also have a very low force. In fact, this spring 21 may be omitted and the force derived from falling of type actuated levers back to their starting position by gravity may be used to return the parts to their starting position and to turn catch 13 against the action of spring 14.

It will be understood that each of the elements described above, or two or more together, may also find a useful application in other types of business machines differing from the types described above.

While the invention has been illustrated and described as embodied in electrically operated business machines, it is not intended to be limited to the details shown, since various modifications and structural changes may be made without departing in any way from the spirit of the present invention.

Without further analysis, the foregoing will so fully reveal the gist of the present invention that others can by applying current knowledge readily adapt it for various applications without omitting features that, from the standpoint of prior art, fairly constitute essential characteristics of the generic or specific aspects of this invention and, therefore, such adaptations should and are intended to be comprehended within the meaning and range of equivalence of the following claims.

What is claimed as new and desired to be secured by Letters Patent is:

1. In an electrically operable business machine, in combination, support means; an operating key movably carried by said support means; linkage means operatively connected to said key; means carried by said support means for urging said linkage means and key to an inoperative starting position; a solenoid operatively connected to said linkage means for actuating said key through said linkage means when said solenoid is energized; a switch located in the circuit of said solenoid; a switch operating member engaging said switch for opening same upon movement of said switch operating member in one direction and for closing said switch upon movement of said switch operating member in an opposite direction, said switch operating member being located in the path of movement of a portion of said linkage means when the latter is moved upon energizing of said solenoid to be moved by said portion of said linkage means in said one direction to open said switch upon energizing of said solenoid so as to de-energize said solenoid immediately after energizing thereof; and releasable catch means carried by said support means for movement to and from a position engaging said switch operating member to prevent move-

ment thereof in said opposite direction, said catch means being located in the path of movement of a portion of said linkage means during return of said linkage means to its starting position after de-energizing of said solenoid so as to be moved by said linkage means away from said position engaging said switch operating member to release the latter for movement in said opposite direction to close said switch.

2. In an electrically operable business machine, in combination, support means; an operating key movably carried by said support means; linkage means operatively connected to said key; means carried by said support means for urging said linkage means and key to an inoperative starting position; a solenoid operatively connected to said linkage means for actuating said key through said linkage means when said solenoid is energized, said linkage means having a portion movable in one direction upon energizing of said solenoid and in an opposite direction upon de-energizing of said solenoid; a switch located in the circuit of said solenoid; a switch operating member movably carried by said support means and located alongside of said portion of said linkage means; first spring means urging said switch operating member to a position closing said switch; first means extending from said portion of said linkage means and engaging said switch-operating member during movement of said linkage means upon energizing of said solenoid to move said switch-operating member to open said switch; a catch movably carried by said support means and located adjacent said switch operating member and said portion of said linkage means; second spring means urging said catch into engagement with said switch operating member to releasably prevent movement of the latter to a position closing said switch; and second means extending from said portion of said linkage means for movement therewith along a path engaging said catch to move the latter away from said switch operating member upon movement of said linkage means back to its starting position, when said solenoid is de-energized, to release said switch operating member to move said switch back to its closed position.

3. In an electrically operable business machine, in combination, support means; an operating key movably carried by said support means; linkage means operatively connected to said key; means carried by said support means for urging said linkage means and key to an inoperative starting position; a solenoid operatively connected to said linkage means for actuating said key through said linkage means when said solenoid is energized, said linkage means having a portion movable in one direction upon energizing of said solenoid and in an opposite direction upon de-energizing of said solenoid; a switch located in the circuit of said solenoid; a switch operating bell crank pivotally carried by said support means, having a first arm engaging said switch to maintain the latter in a closed position and having a second arm located alongside of said portion of said linkage means; a lug extending from said portion of said linkage means and engaging said second arm of said bell crank to turn the latter in a direction moving said first arm thereof to

open said switch upon movement of said portion of said linkage means in said one direction; a catch member pivotally carried by said support means adjacent an end of said bell crank for engaging said end thereof to prevent movement of said bell crank back to its starting, switch-closing position; a second lug fixed to said portion of said linkage means and engaging said catch member during movement of said linkage means in said opposite direction back to its starting position to disengage said catch member from said bell crank; first spring means engaging said bell crank to urge the latter to a position closing said switch upon movement of said catch member away from said bell crank; and second spring means weaker than said first spring means and engaging said catch member to urge the latter to a position engaging said bell crank.

4. In an electrically operable business machine, in combination, support means; an operating key movably carried by said support means; linkage means operatively connected to said key; means carried by said support means for urging said linkage means and key to an inoperative starting position; a solenoid operatively connected to said linkage means for actuating said key through said linkage means when said solenoid is energized, said linkage means having a portion movable in one direction upon energizing of said solenoid and in an opposite direction upon de-energizing of said solenoid; a switch located in the circuit of said solenoid; a switch operating bell crank pivotally carried by said support means, having a first arm engaging said switch to maintain the latter in a closed position and having a second arm located alongside of said portion of said linkage means; a lug extending from said portion of said linkage means and engaging said second arm of said bell crank to turn the latter in a direction moving said first arm thereof to open said switch upon movement of said portion of said linkage means in said one direction; a catch member pivotally carried by said support means adjacent an end of said bell crank for engaging said end thereof to prevent movement of said bell crank back to its starting, switch-closing position; a second lug fixed to said portion of said linkage means and engaging said catch member during movement of said linkage means in said opposite direction back to its starting position to disengage said catch member from said bell crank; first spring means engaging said bell crank to urge the latter to a position closing said switch upon movement of said catch member away from said bell crank; second spring means weaker than said first spring means and engaging said catch member to urge the latter to a position engaging said bell crank; and means for adjusting the location of said lugs on said linkage means.

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