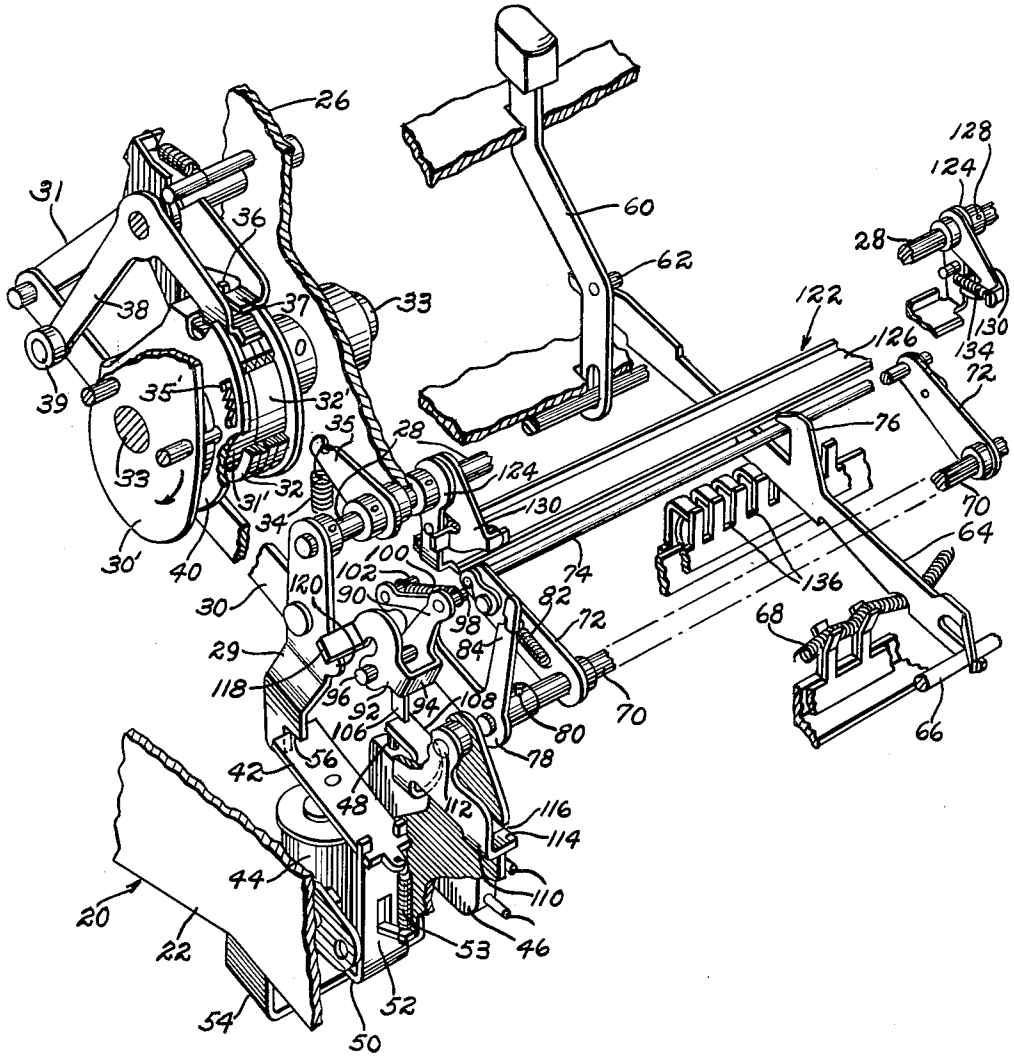
Feb. 28, 1961 W. B. TEMPLETON ET AL 2,973,078

ELECTRIC TYPEWRITER OPERATING MECHANISM

Filed Dec. 12, 1958

3 Sheets-Sheet 1

Fig. 1.



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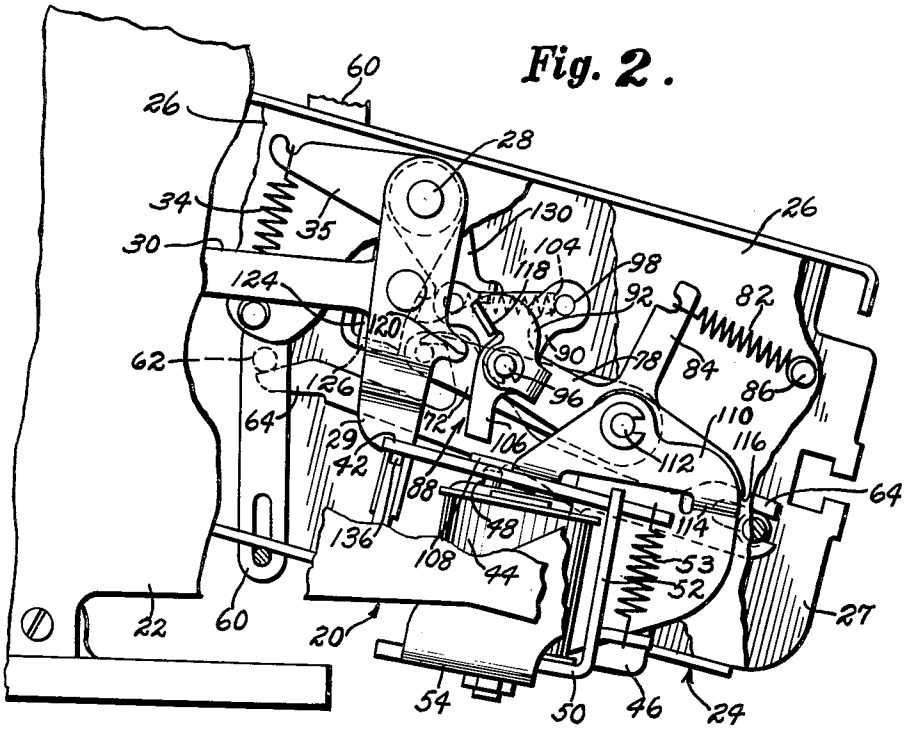
Feb. 28, 1961 W. B. TEMPLETON ET AL 2,973,078

ELECTRIC TYPEWRITER OPERATING MECHANISM

Filed Dec. 12, 1958

3 Sheets-Sheet 2

Fig. 2.



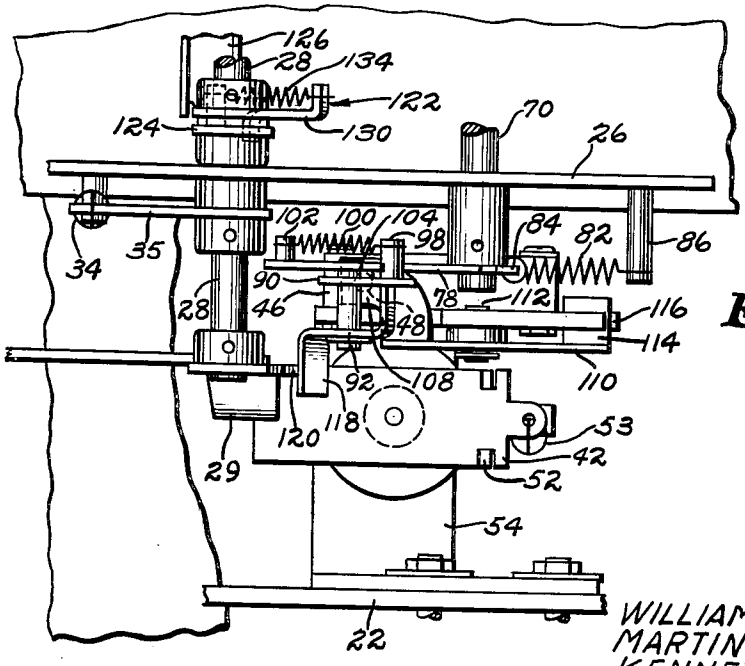


Fig. 3.

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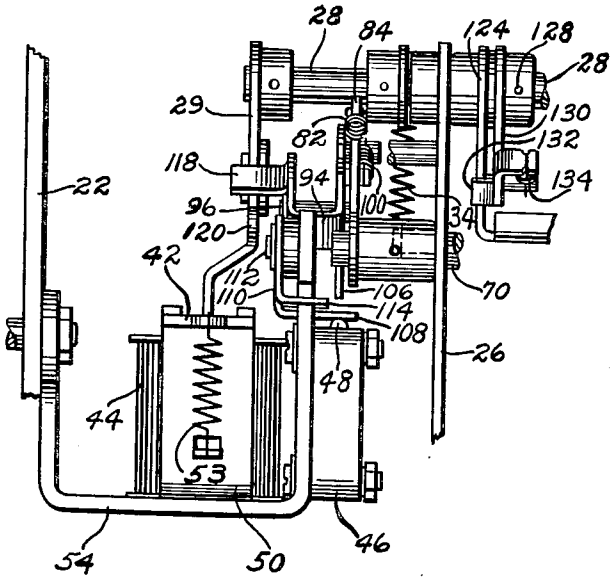
Feb. 28, 1961 W. B. TEMPLETON ET AL 2,973,078

ELECTRIC TYPEWRITER OPERATING MECHANISM

Filed Dec. 12, 1958

3 Sheets-Sheet 3

Fig. 4.



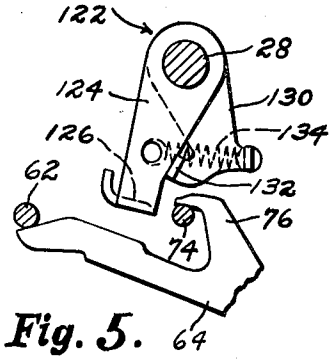


Fig. 5.

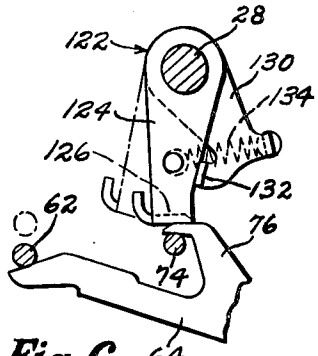
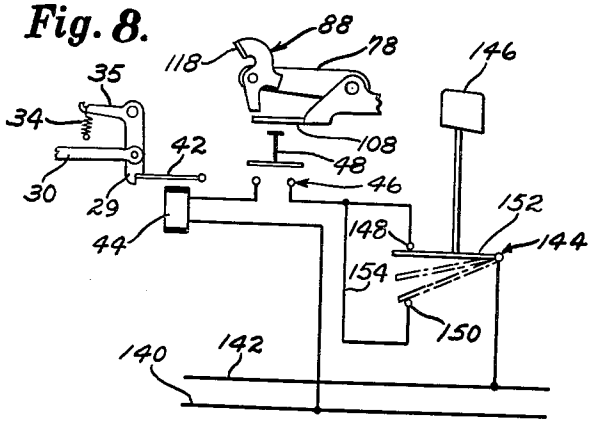


Fig. 6.

Fig. 8.



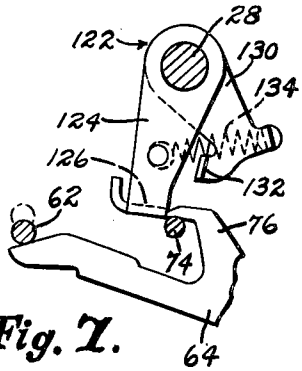


Fig. 7.

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United States Patent Office

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Patented Feb. 28, 1961

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ELECTRIC TYPEWRITER OPERATING MECHANISM

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Filed Dec. 12, 1958, Ser. No. 779,876

10 Claims. (Cl. 197—17)

This invention relates generally to business machines of the type having keyboards and particularly to mechanism for operatively connecting the keys of a power operated typewriter to the power source control of such machines.

One of the objects of the invention is to provide for key indexed business machines, an improved mechanism for operatively connecting the keys to the control of operating components of the machine in such manner as to effect an ease of operation of the keys.

Another object of the invention is to provide a mechanism of the above mentioned character which is sensitively responsive to slight key depression and one in which certain of the operating parts are arranged to co-act in a manner to materially reduce wear of the parts.

Another object of the invention is to provide in a power operated typewriter for effecting cycling operation of the machine without damage thereto in the event that partial depression of a key or keys effects interference between operation of any of the parts of the machine.

Another object of the invention is to provide for an electric typewriter in which operation of power driven typing mechanism is initiated by depression of a typing key, an improved control mechanism to insure proper operation of both typing and functional operations of the machine.

Another object of the invention is to provide an improved cycling type electric typewriter of a character to eliminate malfunctions of cooperating key initiated typing and functional operations.

Other objects of the invention will become apparent from the following description, taken in connection with the accompanying drawings in which:

Fig. 1 is a perspective view of part of an electrically operated typewriter embodying features of the invention;

Fig. 2 is a side view of a keyboard and associated mechanism of the typewriter;

Fig. 3 is a plan view partly broken away;

Fig. 4 is a front view;

Fig. 5 is a detail fragmentary view of certain mechanism of the machine, shown removed therefrom;

Fig. 6 is a view similar to Fig. 5 illustrating the positions the parts will assume in operation of the machine;

Fig. 7 is another view similar to Fig. 5, illustrating the positions the parts may assume under certain conditions of operation; and

Fig. 8 is a diagrammatic view of certain of the machine operating parts and the control system therefor.

Referring to the drawings by characters of reference, there is shown in part a business machine or typewriter having the usual main frame 20 which includes oppositely disposed upright side plates 22 of which only the left side plate is shown. Mounted on the main frame 20 between the side plates 22 is a keyboard frame structure 24 having the usual oppositely disposed end plates 26, 27 (see Fig. 2) and journaled in the end plates is a horizontal shaft 28. The left end of shaft 28 projects outwardly of the end plate 26, as shown in Fig. 3, and

fixed to this end of the shaft is the upper end of a lever 29 to which one end of a link 30 is connected. The other end of the link 30 is connected to a control or release lever 31 of a spring type clutch 32 which functions to operatively connect a cam carrier 31' to a driven cam shaft 33. The clutch control lever 31 is actuated to release the clutch spring 32 when the lever 29 is pivoted by a normally restrained force exerting means or spring 34 which acts on a lever 35 to rotate shaft 28. Fixed to the cam carrier 31' is a number of cams 30' of which only one is shown, the cams being adapted to perform all of the typewriter operations, such as operation of the typing mechanism, carriage tabulation, etc. For a more detailed description of the typewriter including the spring type clutch, reference may be made to the copending application of Robert R. Henderson et al., Serial Number 738,250, filed May 21, 1958, and assigned to the same assignee as the present invention, which application has matured into Patent No. 2,936,703.

Fixed on and to the shaft 33 to rotate therewith is a flanged drum component 32' and adjacent thereto on the shaft is the cam carrier 31' which is tubular in form and functions as the other component of the drum. Surrounding the drum is the clutch spring 32 which is a helical coil spring having one end, as at 35', anchored to the cam carrier 31' and the other end, as at 36, normally abutting the tab 37 of lever 31. The spring 32 is normally tensioned such that the convolutions thereof are spaced from the drum and upon retraction of tab 37 the spring 32 contracts to grip both of the drum components 31' and 32' thus effecting a driving connection between the cam carrier and the cam shaft 33. A bellcrank lever 38 is secured to lever 31 to rotate therewith and has the end of one arm normally positioned over the spring 32 to limit expansion of the spring relative to the drum. To the other arm of the bellcrank lever 38 is attached a cam follower or roller 39 that is adapted to engage a cam 40, formed on the carrier 31'. The cam 40 is engaged by the roller 39 by and following the release of spring 34 and when the spring approaches the completion of one revolution of the cam shaft 33, the cam 40 pivots the levers 38 and 31 to position the tab 37 in the path of the spring end 36 so that the remaining angular movement of the cam shaft will tension the spring 32, thus disengaging the drum components 31' and 32'.

The clutch release spring 34 is normally restrained by a retractable stop member or latch which is preferably an armature 42 of an electro-magnet including the usual coil 44. Energization of the coil 44 is controlled by a normally open switch (not shown) within a casing 46. The switch is closed by depressing an upwardly directed switch operator 48 which may be in the form of a button arranged to project upwardly and externally of the switch casing 46 and preferably having an upper rounded end, as shown. The electro-magnet 44 is mounted on the horizontal leg of the usual angle bracket 50 which has an upright leg 52, the upper edge of which provides a fulcrum for the armature 42. A bracket 54, rigidly secured to the main frame plate 22, supports the electro-magnet and switch unit 46 between the main frame plate 22 and the adjacent end plate 26 of the keyboard frame structure. Normally, the rearward end of the armature 42 engages in a retainer notch 56 in the lower end of the clutch operating lever 29 to hold the lever against rotation counterclockwise, as viewed in Fig. 2, and thus restrain the spring 34 against actuating the clutch control lever 31 until armature 42 is retracted. One end of the spring 34 is attached to the free end of lever 35, and the other end of the spring is anchored to the adjacent end plate 26 of the keyboard frame. The springs

34 and 53 cooperate to move the lever 29 and the armature 42 into normal holding relationship.

Between the upright end plates 26 and 27 of the keyboard frame are mounted conventional typewriter keys, each of which has a stem 60 that carries an abutment 62 for engaging and pivoting its respective one of a number of levers 64. As shown in Fig. 2, the key stem abutments 62 rest respectively on the levers 64, adjacent the rearward ends thereof, the levers 64 being pivoted at their forward ends on a transverse rod 66. All of the levers 64 are urged upwardly against their key stem abutments 62 by a single coil spring 68 that extends transversely beneath the levers and is secured at its opposite ends to the upright end plates 26 of the keyboard frame.

A shaft 70 is journaled for rotation on the upright end plates 26 and 27 of the keyboard 24 and fixed to shaft 70 to rotate therewith is a pair of spaced levers 72 having rearwardly extending free ends joined together by a rod 74. Each of the levers 64 has an integral arm 76 extending upwardly and rearwardly and resting at its rearward end on rod 74. By this arrangement, when a key is depressed, abutment 62 bearing on the rearward end of lever 64 pivots the lever counterclockwise, as viewed in Fig. 2, and through lever arm 76 and rod 74 rotates the shaft 70 in the same, or counterclockwise, direction.

One end of the rotatable shaft 70 extends outwardly from the keyboard end plate 26, and a hub of a key operated lever 78 is fixed to this end of the shaft by a pin 80 so that lever 78 and shaft 70 are rotatable together. A coil spring 82 urges the lever 78 clockwise, as viewed in Fig. 2, the spring having one end attached to an upwardly directed arm 84 of lever 78 and the other end anchored to the frame end wall 26 by a pin 86. Rotation of the lever 78 in a clockwise direction (Fig. 2) by the spring 82 is limited by engagement of rod 74 with the under edge of arm 76.

Carried by the lever 78 is a yieldable abutment member or bail 88 having oppositely disposed parallel legs 90 and 92 joined by a web 94. The legs 90 and 92 have aligning apertures to receive a stub shaft 96 on which the bail 88 is pivotally mounted, the stub shaft having one end secured to lever 78 and extending laterally therefrom. The leg 90 of the bail 88 has an upwardly directed arm that carries a stud 98 to which one end of a coil spring 100 is attached, and the other end of the spring 100 is attached to a stud 102 that is carried by the rearward end of lever 78. The spring 100 is tensioned to hold the stud 98 against a projection 104 on lever 78. It will be seen that the spring 100 holds the bail 88 to lever 78 for pivotal movement together in a counterclockwise direction, as viewed in Fig. 2, and that the bail can be pivoted clockwise relative to lever 78 by overcoming the force of spring 100. Integral with the bail leg 92 is a downwardly extending arm or projection 106 which is arranged to engage and depress the switch button 48 on movement of the bail downwardly. In order to decrease side thrust and accompanying wear of the switch button 48, an abutment member or plate 108 is interposed between the lower end of the projection 106 and the top of the switch button 48. The plate 108 is horizontally disposed slightly above the upper rounded end of switch button 48 and is carried by one end of a lever 110 that is freely rotatable on a stub shaft 112 secured to the inner leg of bracket 54. The stub shaft 112 is axially aligned with shaft 70 and thus the pivot axes of the abutment plate 108 and the key operated lever 78 are concentric. The other end of the lever 110 has an extending tab 114 that projects into a horizontal slot 116 in the inner bracket leg and normally seats on the lower edge of the slot as a stop. The rear arm of lever 110 is made longer and somewhat heavier than the forward arm so that the tab 114 normally seats on the lower edge of the slot whereby to position plate 108 the aforementioned slight distance above the rounded end of the switch button 48.

The leg 92 of the bail 88 has a rearwardly extending arm provided with a laterally extending abutment or tab 118 which is positioned for engagement by the rounded end of an extension 120 on the clutch operating lever 29. When lever 29 is released by armature 42, the lever will be pivoted by spring 34 and the lever abutment 120 will engage and pivot bail 88 relative to lever 78 to release switch button 48 and thus de-energize the electromagnet coil 44.

Mounted on shaft 28 is a locking member or bail 122 which is adapted to position over the end of extension 76 (see Fig. 6) of lever 64 when the latter and therefore key operated lever 78 are pivoted to close switch button 48, the function of bail 122 being to hold lever 78 in the down position until bail 88 releases the switch button 48. The holding bail 122 has upstanding end arms 124 apertured to receive the shaft 28 for rotation thereon, the arms being connected together by a lower web 126 that is adapted to engage the upper edge of extension 76. Fixed to shaft 28, as by pins 128, is a pair of spaced levers 130 which are positioned respectively adjacent the bail arms 124. A laterally extending abutment or tab 132 on each of the levers 130 abuts the adjacent arms 124 of the bail, and a pair of coil springs 134 normally holds the bail to lever 130 for rotation together.

Operation

In operation, when an alpha or numeric key of the typewriter is depressed, the corresponding lever 64 is pivoted and acting on bail rod 74 pivots levers 72 and turns shaft 70 in a counterclockwise direction, as viewed in Fig. 1. Since lever 78 is fixed to shaft 70, the lever also turns counterclockwise and the abutment extension 106 engages and pivots plate 108 and depresses the switch button 48 whereby to energize the electro-magnet coil 44. Upon energization of the coil 44, the armature latch 42 is retracted against the action of its return spring 53, which frees spring 34. Spring 34 acting on lever 35 turns shaft 28 counterclockwise which pivots lever 29, bail 122, and lever 130 in the same direction. The pivoting of lever 29 pulls link 36 to the right as viewed in Fig. 2 which pivots the clutch control lever 31 (see Fig. 1) to release the clutch spring 32 which then contracts to grip and drivingly connect the cam carrier 31' to the cam shaft 33. At about the same time that the clutch operating lever 31 is actuated, the projection 120 on lever 29 engages the tab 118 of the switch operating abutment 88 and pivots the abutment relative to its carrier lever 78 to release switch button 48. Also when the shaft 28 was turned counterclockwise by spring 34, the lever 130 and bail 122, as a unit, rotated with the shaft to position the bail web 126 over and in hold-down relation to the arm 76 of lever 64 whereby to hold lever 64 depressed for the interval of the typing operation.

Disposed beneath the forward ends of the levers 64 is a plurality of interlock members 136 cooperable with and normally receiving the levers 64 to allow a single key to be depressed fully, but preventing the full depression of two or more keys. The interlock members 136 are supported for limited relative movement toward and away from each other to allow for the lever 64 of a key to spread them apart for full key depression. However, when two keys are depressed, the limited movement of the interlock members 136 is insufficient to allow two of the levers to move down to the fully key depressed position. Nevertheless, partial depression of one or two keys is sufficient to cause the retraction of the armature 42 from its holding position and thus initiate a cycle of operation. As a result, instead of the bail 122 moving into the position shown in Fig. 6, holding the key operated lever 64 depressed momentarily, the bail sometimes locks with the end of lever arm extension 76, as illus-

trated in Fig. 7. When this occurs, the spring 134 yields to allow relative rotation or lost motion between the bail 122 and lever 130 to allow completion of the cycling operation without damage to the machine.

Restoration of the indexed key and the drive clutch to their normal position occurs at about 200° of typewriter cam shaft rotation. The high point of the restoring cam 40 rocks the bell crank lever 31 to pull link 30 rearward which pivots lever 29 to a position allowing the armature 42 under the influence of spring 53 to swing up into holding relation with lever 29. As the bail 122 clears the key lever 64, the spring 68 restores the key stem 60 through key lever 64, and spring 82 restores shaft 70 and the levers 78, 72 thereon. This allows spring 100 to reset arm 106 over plate 108.

In the diagrammatic view of Fig. 8, the numerals 140 and 142 designate the main leads fro ma source of electric power and connected across the leads is the coil 44 of the electrically operated latch 42. In series circuit with the coil 44 are the contacts of the key operated switch 46 and in series circuit with switch 46 is a second switch 144 such that both switches must be closed to energize coil 44. The switch 144 is actuated by a key 146 which may be any of the functional keys of the typewriter which require complete depression to effect proper operation of the function. For example, key 146 may be the well known shift key that requires complete depression by the operator to effect proper typing of upper case characters for, as is well known, a partial depression of the key will sometimes result in the typing of part of the lower case and part of the upper case of the character and in addition is damaging to the operating parts.

The switch 144 is diagrammatically illustrated as comprising a pair of fixed contacts 148 and 150 and a movable contact 152 that is normally engaged with contact 148. A shunt circuit including a lead 154 connects the normally open contact 150 in series with switch 46 and across leads 140 and 142. It will be seen that when the key 146 is in its normal or "up" position or is depressed completely to engage contact 150, it is only necessary to close switch 46 to complete the circuit to the coil 44. However, should the operator only partially depress key 146, as illustrated, the circuit remains open and consequently cycling operation of the machine is disabled.

What is claimed is:

1. In a business machine having a control for controlling a cycling operation of the machine and a key to initiate the cycling operation, a mechanism for operatively connecting the key to the control comprising a lever acting to pivot in one direction to actuate the control and initiate operation of the machine, a solenoid, a solenoid actuated latch normally holding said lever against pivoting in said one direction and retractable to release said lever, a solenoid switch operator operable to effect withdrawal of said latch to release said lever, a key operated lever pivotal in one direction to operate said switch operator, a yieldable member movable with said second lever to engage and actuate said switch operator upon predetermined angular movement of said second lever in said one direction, said yieldable member movable relative to said second lever to release said switch operator, and means for moving said yieldable member by and upon release of said first lever.

2. In a business machine having a control for controlling a cycling operation of the machine and a key to initiate the cycling operation, a mechanism for operatively connecting the key to the control comprising a lever acting to pivot in one direction to actuate the control and initiate operation of the machine, a solenoid, a solenoid armature normally holding said lever in inactive position and retractable to release said lever, a solenoid switch operator, a key operated lever pivotal in one direction to actuate said operator, an arm carried by and pivoted on said key operated lever to actuate said solenoid switch operator, a locking member movable with said first lever and operable to lock the key operated lever in operated position upon retraction of said armature, said arm engaged and moved by said first lever relative to said key operated lever to release said switch operator, and a yieldable connection operatively connecting said locking member to said first lever.

3. In a business machine having a control operable to effect a cycling operation of the machine and a key to initiate operation of the control, a mechanism operatively connecting the control and the key comprising a lever biased to pivot in one direction and actuate the control, a solenoid, a retractable solenoid armature normally holding said lever against pivoting in said one direction, a switch operator controlling retraction of said armature, a key operated lever, an arm carried by and pivoted on said key operated lever and yieldingly held thereto in a position to operate said operator upon pivoting of said key operated lever in one direction, said arm pivotal relative to said key operated lever by said first lever upon retraction of said armature by said operator to release the latter, and a locking member movable with said first lever to hold said key operated lever in operated position during release of said switch operator by said arm.

4. In a business machine having a control operable to effect a cycling operation of the machine and a key to initiate operation of the control, a mechanism operatively connecting the control and the key comprising a lever biased to pivot in one direction and actuate the control, a solenoid, a retractable solenoid armature normally holding said lever against pivoting in said one direction, a switch operator controlling retraction of said armature, a key operated lever, an arm carried by and pivoted on said key operated lever and yieldingly held thereto in a position to operate said operator upon pivoting of said key operated lever in one direction, said arm pivotal relative to said key operated lever by said first lever upon retraction of said armature by said operator to release the latter, a locking member movable with said first lever to hold said key operated lever in operated position during release of said switch operator by said arm, and yieldable means operatively connecting said locking member to said first lever.

5. In a business machine having a control operable to effect a cycling operation of the machine and a key to initiate operation of the control, a mechanism for operatively connecting the control and the key comprising a control operating lever biased to pivot in a direction to actuate the control, a solenoid, a solenoid armature normally restraining said lever and retractable to release said lever, a switch operating member controlling retraction of said armature, a key operated lever, an arm carried by and pivoted on said key operated lever and yieldingly held thereto in a position to operate said switch operating member upon pivoting of said key operated lever in one direction, said arm pivotal relative to said key operated lever by said control operating lever upon retraction of said armature, and a movable abutment member interposed between and operatively connecting said arm and said switch operating member.

6. In a business machine having a control operable to effect a cycling operation of the machine and a key to initiate operation of the control, a mechanism for operatively connecting the control and the key comprising a control operating lever biased to pivot in a direction to operate the control, a solenoid, a solenoid armature normally restraining and operable to release said lever, a switch operating member operable to release said armature, a key operated lever, an arm carried by and pivoted on said key operated lever, said arm yieldingly held to

said key operated lever in a position to actuate said switch operating member upon pivoting of said key operated lever to one position, an abutment member pivoted concentrically with said key operated lever and interposed between said switch operating member and said arm, said abutment member unbalanced to pivot out of engagement with said switch operating member, said arm pivotal relative to said key operated lever to release said abutment member and actuated by said control operating lever upon release of said armature, and a locking member pivotal with said control operating lever to hold said key operated lever in said one position during pivoting of said arm.

7. In a business machine having a control for controlling a cycling operation of the machine and a key to initiate the cycling operation, a mechanism for operatively connecting the control to the key comprising a lever for operative connection to the control, a spring acting to pivot said lever to actuate the control, a solenoid, a solenoid actuated latch member normally restraining said spring, a solenoid switch operator movable to a position to effect release of said latch member, a movable key operated member, an abutment member carried by said key operated member to engage and move said solenoid switch operator, said abutment member movable relative to said key operated member to release said solenoid switch operator and actuated by said lever when pivoted by said spring, and a normally inactive yieldable locking member operatively connected to and movable by said lever to a position to hold said key operated member in operated position.

8. In an electric typewriter having a cam carrier operable to effect a cycling operation initiated by operation of a typing key, a normally disengaged clutch operable to connect the cam carrier to a driving means, means exerting a force acting to engage said clutch, a latch normally restraining said force exerting means, an electromagnet operable when energized to retract said latch, a switch member operable by the typing key and controlling energization of said electro-magnet, a second switch member in circuit with said first switch member and controlling energization of said electro-magnet, said second switch member normally in closed circuit position to render said first switch member normally in sole control of the energization of said electro-magnet and movable to a position to open the circuit of said electro-magnet irrespective of said first switch member, and a movable member operable to move said second switch member to said second mentioned position.

9. In an electric typewriter, a cam carrier operable to effect a cycling operation, a normally disengaged clutch operable when engaged to connect said cam carrier to a driving shaft, a clutch release member normally holding said clutch disengaged, a spring acting to operate said release member to effect engagement of said clutch, an armature normally in a latched position restraining said spring and operable when retracted to release said spring, an electro-magnet positioned adjacent said armature, and operable when energized to retract said armature, a normally open switch member controlling energization of said electro-magnet, a typing key depressible to close said switch member, a second switch member in series circuit with said first switch member and cooperable therewith for mutually controlling energization of said electromagnet, said second switch member normally closed to render control normally and solely under operation of said first switch member, said second switch member having a second closed position cooperable with said first switch member on closing of the latter to effect energization of said electro-magnet, and a function control key operable to move said second switch member to said second position, said second switch member being ineffective in any intermediate position.

10. In a business machine having a clutch operator for controlling a cycling operation of the machine and a key to initiate the cycling operation, a mechanism for operatively connecting the key to the clutch operator comprising an actuator member to be operatively connected to the clutch operator and biased to actuate the clutch operator to effect a machine cycling operation, a retractable latch member normally restraining said actuator member, electrically operable means operable when energized to retract said latch member, a switch controlling said electrically operable means, a key operated member movable toward and away from said switch, a yieldable member movable with said key operated member to engage and actuate said switch upon predetermined movement of said key operated member toward said switch, said yieldable member movable relative to said key operated member to release said switch, and means for moving said yieldable member by and upon release of said actuator member by said latch member.

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