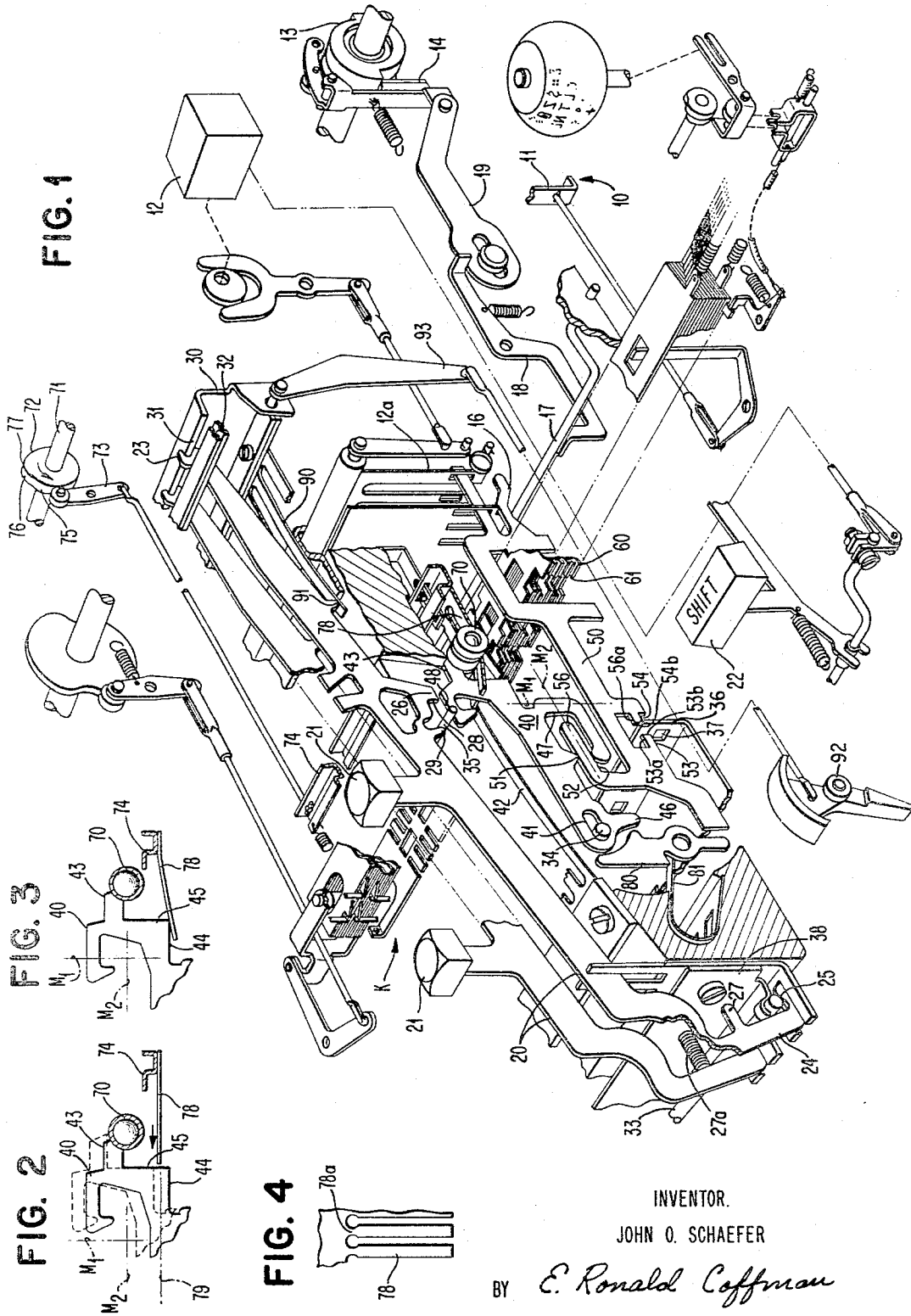


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KEYBOARD SEQUENCE DISCRIMINATOR WITH DIFFERENT
CODES FOR UPPER AND LOWER CASE
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KEYBOARD SEQUENCE DISCRIMINATOR WITH DIFFERENT CODES FOR UPPER AND LOWER CASE

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This key sequence discriminator permits a typist to type familiar sequences in short bursts or flurries without causing a typewriter malfunction.

Skilled keyboard operators, such as typists in the case of a typewriter keyboard, are capable of very rapid, short character sequence entries. A familiar sequence of two characters, e.g., "T," "H," may be entered at a rate of 25 characters per second, while the typist's average speed is only 5 characters per second. It is desirable that a keyboard be capable of receiving such a data surge without confusion as to the sequence of entry, in order to take full advantage of the typist's skill and not to interfere with the typist's rhythm. Keyboard controlled mechanism often operates in fixed cycles that exceed average typing speeds, but for practical purposes do not exceed the possible flurry speeds. In such cyclically operating mechanisms there is ordinarily only a short early portion of the cycle during which key entry information can be received. A sequence discriminator thus must prevent presentation of two conflicting data items during the data reception period of the cycle. Also, the discriminator must permit storage of the second of two data items immediately after the data reception period of the cycle. Key sequence discrimination, as currently practiced, is limited in speed principally by structural limitations of the apparatus.

An important object of my invention has thus been to provide a keyboard having an inherently fast, error free, acceptance of data by sequential finger action. My invention employs a direct key-operated control link that is filtered through a ball interlock to prevent simultaneous multiple key operation. A separate probe for data entry is activated by operation of the control link, but is free for limited movement relative thereto. A cycle is initiated by activation of any probe. Early in the cycle, probe controlled encoding mechanism moves from its normal probe receptive condition to a non-receptive condition, thus terminating the period during which data can be received. Immediately, without any substantial delay, my sequence discriminator can permit operation of a second control link. The speed of discrimination is accomplished by the use of a plurality of independently flexible, straight leaf springs, each of which cooperates with respective control links to remove an operated control link from the ball interlock without interfering with the operation of a second control link. The control links are operated by movement in one direction that is at an angle relative to the straight leaf spring, and are removed from the ball interlock by movement along a path substantially lengthwise of the straight leaf springs. The column strength of the leaf springs permits transfer of force therethrough for removal of a control link from the ball interlock. The flexure strength, or rather weakness of the leaf spring relative to nonaxial loadings thereon, prevents the leaf springs from interfering with the second operated control link.

These and other objects, features, and advantages of my invention will be more fully understood and appreciated by those skilled in the art from the following description of a specific illustrative embodiment wherein

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reference is made to the accompanying drawings, of which:

FIGURE 1 is a partially exploded perspective view of a keyboard constructed in accordance with this invention wherein duplicated parts are omitted for the sake of clarity;

FIGURES 2 and 3 are operational views of the sequence discriminating mechanism as shown in FIGURE 1; and

FIGURE 4 is a top or plan view of leaf spring restore fingers showing a preferred detail of their construction.

Referring now specifically to FIGURE 1, a keyboard encoder K is schematically shown as controlling a cyclically operable data utilization mechanism, such as typewriter character selecting mechanism 10 like that fully shown and described in U.S. Patent 2,919,002 entitled, "Selection Mechanism for a Single Printing Element Typewriter," issued to L. E. Palmer, Dec. 29, 1959. The character selecting function of the printer is controlled by character selecting latches 11 and printer shift mechanism 12. The operating cycle of the printer is generated by a one revolution clutch 13 that is controlled by a positively restored clutch latch mechanism 14.

The keyboard K includes a plurality of normally non-operative key levers 20 for controlling character print and operational functions. Finger pads or buttons 21 thereon, are arranged in a plurality of rows as is common with stenographic typewriters. The keyboard K also includes a shift key 22 for controlling operation of the shift mechanism 12.

The key levers 20 are pivotally mounted at their rear ends by a C-slot portion 23 that spans a flange edge 31 of a substantially stationary typewriter frame structure 30. The key levers are loosely held in place by a removable holding or retaining bar 32 that limits forward sliding movement of the C-slot portion 23. Upward movement of each key lever 20 is limited by a downwardly turned leg portion 24 which terminates in a hook 25 that is engaged by a frame-mounted holding or retaining bar 33. It will be appreciated that key levers 20 are each readily removable for modification, substitution, or repair, simply by removal of retaining bars 32 and 33.

Each keylever 20, when depressed to its operative position, moves a sequence discriminating and actuating interposer or control link 40, by a primary dobber 26, to actuate a probe or data entry member 50 to an active position wherein it inhibits the cyclic movement of selected slides 60 as determined by long and short slots 61 therein. Each slide 60 which is permitted to move, operates an associated character selecting latch 11 to control character selection. The details of the encoding slides and their operation are disclosed and claimed in U.S. patent application 520,775, filed by L. E. Palmer, J. O. Schaefer, and R. J. Young, simultaneously herewith, entitled, "Encoder." Briefly, the slides 60 are capable of being probed in two different directions for generating different coded outputs, depending upon the direction of probing. The probing direction is conveniently selected by a preliminary shift status, thus permitting the encoding of shift related information, such as print head velocity, in addition to basic character identification information.

Key sequence discrimination

The interposer or control link 40 for each key lever 20 is supported by stationary post 34 and elongated slot 41 for motion along a first ordinate M₁, and a second ordinate M₂. A leaf spring 42 biases the interposer 40 and key lever 20 upwardly along ordinate M₁ to a non-operative position against a limit stop bar 35.

The interposer 40 has a forward flange or tooth 43 which activates a ball interlock mechanism 70 of well-

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known construction when moved downwardly thereinto upon key depression. The ball interlock 70 is capable of receiving only one tooth 43 at any given time. Downward movement of the interposer 40 along ordinate M_1 is simultaneously transferred to the probe member 50 through a slidable rotatable coupling 51 between the interposer 40 and a positioning arm 52 of the probe member 50. The probe member 50 includes a pair of oppositely directed latch fingers 53 and 54 having respective top or latch-active edges 53a and 54a, and end or latch-inactive edges 53b and 54b. The top edges 53a and 54a cooperate with a stationary frame-mounted bracket 35 and an opening 37 therein to latch the interposer 40 in its operative position against the bias of the spring 42. The end edges 53b and 54b cooperate alternately with the bracket 36 to latch the probe member 50 against a status data bias means provided by a shiftable leaf spring 12a or other resilient urging means.

Each probe member 50 includes a clutch actuating portion 16 which employs the motion of the probe member moving to its active position to initiate operation of a printing cycle by picking the clutch latch 14 through a control bail 17, bell crank 18 and transfer bar 19. As fully explained in the aforementioned U.S. Patent 2,919,002, picking of the cycle clutch latch 14 causes rotation of the various operational shafts within the printer by connecting them through cams, secondary clutches, etc., to a continuously rotating power supply (not shown).

One function of the printer is to restore the keyboard mechanism to its original condition to permit entry of further data. Keyboard restoration is accomplished by moving a previously activated interposer 40 leftwardly along ordinate M_2 , first to remove it from the ball interlock 70, and, second to release latch fingers 53 and 54 to permit upward restoration along ordinate M_1 . Included in the aforementioned various operational shafts is shaft 71 carrying a cycle time operated restore cam 72 that operates on a follower lever 73 to control the reciprocation of a restore bail 74. The cam 72 has a first, quick-rise surface portion 75 for deactivating the ball interlock 70; a dwell portion 76, during the operation of which the character selecting movement of slides 60 is completed; and a probe and interposer unlatching rise surface portion 77.

As best shown in FIGURES 2 and 3, the restore bail 74 is connected to the various interposers 40 by force transfer means, including independent elongated leaf spring restore fingers 78, which extend substantially in the direction of ordinate M_2 and are movable longitudinally by bail 74 along a rectilinear path 79. Each interposer 40 includes a projecting corner or shoulder portion 44 having a force receiving edge surface 45 extending substantially normal to ordinate M_2 . The edge surface 45 of each interposer, when operative, lies in the path 79 of its associated finger 78, which, due to its columnar strength, will transfer moving force thereto. The fingers 78 are thin in the direction of ordinate M_1 and are laterally undercut near their base (FIGURE 4) to provide a bending stress concentration section 78a. Accordingly, the fingers 78 deflect freely upon engagement by an interposer 40 moving along ordinate M_1 .

The normal operation of the restore fingers 78 is shown in FIGURE 2. An interposer 40 has been moved from its dotted line position to its depressed position wherein its flange 43 is engaging and thereby activating the ball interlock 70. Its associated restore finger 78 has just begun to move and is about to engage the shoulder 44 of the interposer. Further movement of the restore finger 78 in the direction of the arrow will drive the interposer 40 to the left of FIGURE 2 inasmuch as the column strength of the finger 78 is selected to resist buckling under the loading required for this operation.

FIGURE 3 on the other hand shows a second inter-

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poser 40 that has been depressed at some time shortly after the interposer of FIGURE 2 has been driven from the ball interlock 70. Although the previous cycle is not complete, and spring restore finger 78 lies in the downward path of the second interposer 40, and downward movement thereof is not inhibited since the bending strength of the restore finger 78 in the vertical plane is low.

Returning to FIGURE 1, it will be recalled that downward movement of an interposer 40 along ordinate M_1 causes substantially simultaneous downward movement and latching operation of its associated probe member 50. Accordingly, the subsequently operated interposer 40 of FIGURE 3 will immediately latch its probe member 50, even prior to the restoration of the previously operated interposer 40. Full activation of the second latched probe member 50 will be prevented, however, by one or more slides 60 which have begun to move under the control of the previously operated interposer 50. The discrimination speed of the keyboard K can be completely divorced from the encoding mechanism, if desired, by adding a second ball interlock to cooperate with the probe members 50. Storage of the second activated probe member 50 thus does not depend upon any movement of the slides 60. I have found, however, that the inertia of slides 60 is quite low, and reliance on their movement does not pose any significant delay considering ordinary typing operations.

Resuming the description of the normal restore operation, continued motion of the restore fingers 78 drives the interposer 40 leftwardly as shown in FIGURE 1. At least a portion of this motion is transmitted to the probe member 50, either through a direction reversing link 80, which engages tab 46 of the probe 40 and tail 55 of the probe member 50, or through direct connection 47 which engages an end portion 56 of the probe member positioning arm 52. The two separate direction related restore connections are required to accommodate the two active latching positions of the probe member 50. The restore motion removes the latching finger 53 or 54 from the opening 37, thus permitting the leaf spring 42 to restore the interposer 40 and the probe member 50 upwardly through connection 51 therebetween.

Single action mechanism

The leftward restore motion of interposer 40 also displaces an interposer actuating surface 48 thereof from under the primary dobber 26. In the event that the keylever 20 remains down, the interposer 40 will fully cycle, restoring the probe member 50 to its inactive position, but will itself come to rest against a shoulder 27 of the dobber 26 under the urging of spring 81. The keylever 20 is prevented from transferring any downward force to the interposer 40 by a limit stop lug 28 that engages a stationary frame part 38. Accordingly, the key lever 20, in its position as limited by lug 28, cannot again operate the interposer 40 until it is first released permitting the full restoration of interposer actuating surface 48 into cooperative alignment with the primary dobber 26.

Repeat cycle mechanism

It is often desirable to permit certain keys to selectively operate for one cycle only, or for a series of cycles upon a single depression. For example, underlining is most conveniently accomplished in this manner. The keylevers 20 each include a secondary dobber 29 that is normally prevented from engaging actuating surface 48 by the stop lug 27. The left hand keylever 20 has been modified by substitution of a coil spring 27a for the lug 27. The modified keylever 20 thus can be forced beyond its previous limit to bring secondary dobber 29 into engagement with surface 48 to cause repeat actions of the interposer 40 and probe 50 by holding the interposer 40 at the bottom of its movement along ordinate M_1 .

Touch control

In any multirow keyboard the feel of various key buttons 21 tends to vary due to the difference in mechanical advantage provided by the distance of the key button from the various reaction force points. The principal forces involved in this keyboard are the spring 42, the frictional force between the latch surfaces 53b and 54b, and the latch bracket 36. All of these forces act through the dobber 26 of the key levers 20. To compensate for the varied mechanical advantage, trimming springs 90 are provided and engage a tab 91 of the key levers 20 which provides an initial deflection reaction and corresponding resilient force in the springs 90. The width of each spring 90 is selected by determining the desired feel force increase between the stroke limits, considering the location of its associated keybutton. The initial feel-force or resistance is controlled by the length of tabs 91, again considering the location of its associated keybutton. An operator touch control lever 92 is also provided to vary the initial feel across the entire keyboard by pivoting the springs 90 as a group through crank arm 93. The touch control mechanism is held in any given position by suitable detent or friction means (not shown).

Those skilled in the art will appreciate that I have provided an encoding keyboard that achieves speed and versatility through the use of relatively simple mechanism. While some specific preferred embodiments of my invention have been disclosed for purposes of illustration, it is to be understood that various modifications, additions, and deletions can be made to the disclosed mechanism without departing from the scope and spirit of my invention as defined by the following claims.

I claim:

1. In a keyboard for entering data into a cyclically operable data utilization mechanism comprising: a plurality of manually operable keybuttons movable individually from a normally non-operative position to an operative position, an input control mechanism associated with each keybutton for transferring keybutton data to the utilization mechanism, each control mechanism comprising: a control link, means supporting the link for movement along two substantially different ordinates, means normally retaining the link in a non-operative position, the link being normally operatively connected to its associated keybutton for movement along one of the ordinates to an operative position upon operation of said associated keybutton, means for latching the link in its operative position upon movement thereto, the latching means being releaseable upon predetermined movement of the link along the other of the ordinates, and means operative at a predetermined time in the cycle of the utilization mechanism for moving an operative link along the other ordinate and including force transfer means between the utilization mechanism and each of the links comprising:

an independent elongated leaf spring extending substantially in the direction of the other ordinate, said leaf spring being cyclically moveable along a path extending lengthwise thereof, and

a projecting corner portion formed on the control link defining a force receiving edge surface that is substantially normal to the other ordinate, said corner portion lying normally out of the path of said leaf spring when the link is in its non-operative position and lying in the path of said leaf spring when the link is in its operative position.

2. A keyboard as defined in claim 1 wherein each of said elongated leaf springs is laterally undercut at a location along its length to provide an effective section of bending stress concentration.

3. A keyboard as defined in claim 1 further comprising: interlock means operable when activated to prevent movement of any control link from its non-operative

to its operative position, said interlock means being activated upon movement of any control link from its non-operative to its operative position and deactivated by a second predetermined movement of the link along the other of the ordinates, said second predetermined movement being of less magnitude than the latch releasing predetermined movement.

4. A keyboard as defined in claim 3 wherein the cyclic link moving means further comprises:

a cyclically operable cam, and follower means operatively connected thereto for controlled movement thereby, said follower means being connected to all of said leaf springs for delivering cam controlled motion thereto, said cam including a first surface portion that is operative during an early part of the utilization mechanism cycle to move the link along the other ordinate at least by said second predetermined movement.

a second surface portion operative during a latter part of the utilization mechanism cycle to move the link along the other ordinate at least by the remainder of the latch releasing predetermined movement, and a dwell surface portion positioned between said first and second surface portions.

5. In a keyboard for entering data into a cyclically operable data utilization mechanism comprising a plurality of manually operable key buttons movable individually from a normally non-operative position to an operative position, an input control mechanism associated with each keybutton for transferring key button data to the utilization mechanism, each control mechanism comprising a control link, means supporting the link for movement along two substantially different ordinates, means normally retaining the link in a non-operative position, the link being normally operatively connected to its associated key button for movement along one of the ordinates to an operative position upon operation of said associated keybutton, a data entry member operatively connected in force transfer relationship with the control link for movement thereby from an inactive position to an active position and vice versa, means for latching the link and data entry member in their respective operative and active positions upon movement thereto, the latching means being releaseable upon predetermined movement of the link along the other of the ordinates, and means operative at a predetermined time in the cycle of the utilization mechanism for moving the link along the other ordinate and including force transfer means between the utilization mechanism and each of the links comprising:

an independent elongated leaf spring extending substantially in the direction of the other ordinate, said leaf spring being cyclically moveable along a path extending lengthwise thereof, and

a projecting corner portion formed on the control link defining a force receiving edge surface that is substantially normal to the other ordinate, said corner portion lying normally out of the path of said leaf spring when the link is in its nonoperative position and lying in the path of said leaf spring when the link is in its operative position.

6. A keyboard as defined in claim 5 further comprising:

interlock means operable when activated to prevent movement of any link from its nonoperative to its operative position, said interlock being activated upon movement of any link from its nonoperative to its operative position and deactivated by a second predetermined movement of the link along said other ordinate, said second predetermined movement being of less magnitude than said latch releasing predetermined movement whereby said interlock is deactivated prior to movement of said data entry member from its active to its inactive position.

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7. A keyboard as defined in claim 5 further comprising:

means responsive to the activation of one data entry member for preventing activation of a second data entry member.

8. In a cyclically operable mechanism, the data input control mechanism comprising a plurality of control links, means supporting each of said links for movement along two substantially different ordinates, means normally retaining said links in nonoperative positions, means for moving each of said links selectively along one of said ordinates to an operative position, means for latching each of said links in its operative position upon movement thereto, the latching means for each of said links being releasable upon predetermined movement thereof along the other of said ordinates, and means operative at a predetermined time in the cycle of the utilization mechanism for moving an operative link along said other ordinate and including force transfer means between the utilization mechanism and each of said links comprising:

an independent elongated leaf spring extending substantially in the direction of said other ordinate, said leaf spring being cyclically moveable along a path extending lengthwise thereof, and

a projecting corner portion formed on the control link defining a force receiving edge surface that is substantially normal to said other ordinate, said corner portion lying normally out of the path of said leaf

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spring when the link is in its nonoperative position and lying in the path of said leaf spring when the link is in its operative position.

9. A keyboard as defined in claim 8 wherein each of said elongated leaf springs is laterally undercut at a location along its length to provide an effective section of bending stress concentration.

10. Data entry means as defined in claim 8 further comprising:

interlocks means operable when activated to prevent movement of any control link from its nonoperative to its operative position, said interlock being activated upon movement of any control link from its nonoperative to its operative position and deactivated by a second predetermined movement of the link along the other of said ordinates, said second predetermined movement being of less magnitude than said latch releasing predetermined movement.

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