Fig. 2

Fig. 3

A  starting impulse
B  adjusted impulse
C  delayed starting impulse
D  adjusted impulse
E  end impulse
F  adjusted reset impulse
G  working impulse
H  amplified reset impulse

Time

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KEYBOARD APPARATUS HAVING MEANS TO CONTROL DURATION OF ACTUATION OF CIRCUIT

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The present invention relates to an electric operation control apparatus, and more particularly to key operated control apparatus having an electric timing device for controlling operations carried out in a business machine, such as a typewriter or calculator.

Business machines which have manually actuated keys and key-operated selector switches are preferably constructed so that the function or operation caused by actuation of a key is carried out independently of the manual engagement of the key by the operator.

In accordance with the prior art, the actuated key starts the operation, and simultaneously closes a switch energizing a relay which automatically stops the operation after a predetermined time by opening the key operated switch. In this manner, a precise operation of the switch independently of the manual operation is achieved, but such an arrangement is unsuitable for a keyboard comprising a great number of keys, since there is not sufficient space available for a corresponding number of relays.

It is the object of the invention to provide an operation control apparatus by which certain functions are carried out upon actuation of a selector member, but independently of the same.

Another object of the invention is to provide apparatus which, upon actuation of a key, carries out an operation at a time and for a duration determined by an electric timing device.

Another object of the invention is to control operations by a timing device which is energized by each of a plurality of manually operated keys.

Another object of the invention is to provide a control apparatus for a business machine, such as a typewriter or calculator which, upon actuation of any selected key, causes a corresponding operation to take place a selectable time after actuation of the key, and for a duration independent of the duration of the key actuation.

Another object of the invention is to provide a business machine with an electronic timing device controlling the start and duration of operations carried out by electrically operable means of the business machine, after the respective operation has been selected by actuation of a key.

With these objects in view, the present invention relates to an electric operation control apparatus, which is particularly suitable for a business machine. One embodiment of the invention comprises a set of selector members, such as the keys of a typewriter or accounting machine, a set of selector switches respectively operated by the keys; a set of electrically operable means, such as electromagnetic means or operating type actions, respectively connected with the selector switches; control means, preferably including universal bar which locks any actuated key; a start switch actuated by the control means; and an electric timing device having an output connected with the selector switches and an input connected with the start switch.

The electric timing device preferably includes adjustable flip-flops energized under the control of the start switch for producing at the output a control impulse which is supplied through the respective closed selector switch to the respective electrically operable means so that the same performs its operation. The moment of the start of the operation, and the duration of the operation is determined by adjustment of the flip-flops.

Preferably, the electrical timing device has a second output, and a flip-flop connected to the second output and receiving an impulse from the first-mentioned flip-flops. The second output is coupled with an electric control means, such as an electromagnetic means, which causes release of the actuated key after completion of the desired operation.

The advantage of the arrangement of the present invention is that in a very simple manner, operation of any selected key causes the control of the operation by the same device so that all operations are carried out at the proper time and for the desired duration. The selector switches are operated by the keys, but only serve to prepare the circuit, which is completed by the flip-flops of the electric timing device.

In the apparatus of the invention, each actuated selector key remains locked until the operation has been completed, and means are provided for preventing simultaneous actuation of two or more keys.

By adjustment of a flip-flop in the timing device, the start of the control impulse is determined so that the control impulse is produced only after the respective selector switch has been closed.

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 perspective view illustrating the construction of an apparatus according to one embodiment of the invention, and including a fragmentary schematic circuit diagram;

FIG. 2 is a diagram illustrating the electric circuit of the apparatus; and

FIG. 3 is a schematic diagram illustrating the sequence of impulses in the timing device.

Referring now to the drawings, and more particularly to FIG. 1, a set of keys 1 is provided in a keyboard of which only three keys are shown. Each key has a stem 10 guided in a U-shaped support 12 which has corresponding guide slots. A spring 11 engages each key to the normal inoperative position, and upon manual actuation, a selected key is moved downward so that its locking projection 10c moves into a closed channel which is secured to the frame and is filled with a row of locking balls 20 which permit only a single locking projection 10c to enter the channel, so that only one key can be depressed and actuated. Channel 2 has a set of projecting arms 21 respectively registering with arms 10, each arm 21 having an upright projection 22 carrying a selector switch 3 associated with the respective selector key 1, and operated by a projecting portion 10b of the associated selector key. In the illustrated example, selector switch 3 has connectors 3a, a shifting spring 3e engaged by projection 10b, and a pair of contacts 3d. Upon actuation of the key, the respective switch 3 is operated so that the contact spring 3e engages the lower contact 3d. The construction of the selector switch is shown by way of example, and any other suitable switch may be used.

One connector 3a is connected to an electric timing device 23, which will be explained hereinafter in detail with reference to FIG. 2. Switches 3 are respectively connected in series to electrically operable means 59, to 59, as shown in FIG. 2.
Each stem 10 has a pivot pin on which a pawl 18 is mounted for angular movement. A spring 19 is secured to a projection 10a of the key stem, and to an arm 18b of the respective pawl 18 so that the same is normally turned in counterclockwise direction to a position in which a stop arm 18a abuts the edge of the respective key stem 10.

A locking member has two arms secured to a shaft 40 and a universal bar 4 extending across all key stems 10 and pawls 18. A spring 13 is secured to a stationary pin, and urges the locking member to turn in clockwise direction until abutting a stop shoulder 5a of a control lever 5 which is mounted for turning movement on a pivot pin 16. Locking bar 4 is U-shaped and includes an upper leg portion 4a and a lower leg portion 4b. Pawls 18 are located within the cavity of the U-shaped locking bar 4.

When a selected key 1 is actuated, the respective pawl 18 acts on the lower leg portion 4b to turn the locking member in counterclockwise direction so that the upper leg portion 4a moves toward the stems of the keys. A locking projection 10e of the depressed actuated key 1 is located below leg portion 4a, so that the upper edge of the locking projection 10e is engaged by the locking bar 4 when the same has been turned to the locking position by the respective pawl 18. When locking bar 4 is in this position, and the respective depressed key 1 locked, the locking portion 4c of the locking bar 4 has moved into the region of the stop shoulder 5b of locking lever 5, and the latter moves downward under the action of spring 14 so that the stop shoulder 5b snaps behind locking projection 4c whereby locking member 4 and the actuated key are locked.

Locking lever 5 is a double armed lever whose other arm 5c is connected with the armature of an electromagnetic means 6 which includes a winding 6b, terminals 6e, and a stationary yoke 6a on which pivot pin 16 of locking lever 5 is supported.

When winding 6b is energized in a manner which will be described hereinafter in greater detail, locking lever 5 is turned in clockwise direction so that stop shoulder 5b releases locking projection 4c, permitting spring 13 to turn locking member 4 in clockwise direction to its normal position abutting stop shoulder 5b, and releasing locking projection 10e of the respective key so that the respective spring 11 returns the key to its normal inoperative position.

The input of the electric timing device 23 is connected to a start switch 7 which is operated by arm 5e of locking lever 5 at the moment in which lever 5 performs its locking movement in counterclockwise direction to lock locking bar 4 in the position locking a depressed key lever. Consequently, the actuation of a selected key lever will not only cause actuation of the respective associated selector switch 3 by projection 10b, but will also cause actuation of the start switch 7 by the locking member 4 and control lever 5.

Members 4, 13, and 5 constitute control means operable by each actuated selector key to move to a control position locking the respective actuated key, and actuating start switch 7.

Start switch 7 has connectors 7a, contacts 7d, a contact spring 7b, and a shifting spring 7c cooperating with lever 5.

FIG. 2 illustrates the electric circuit within the electronic timing device 23 which is schematically indicated as a box in FIG. 1. Start switch 7 has two outer connectors 7a connected to a voltage source, and a connector 7b connected to the input 51a of a first monostable flip-flop 51 which has an output 51b.

When switch 7 is actuated by control lever 5, the positive pole of the voltage source is connected with input 51a, and a starting impulse A is given to flip-flop 51, as also electromechanically indicated at A in FIG. 3.

However, flip-flop 51 is adjustable in a well known manner to delay the starting impulse which is schematically indicated by a double arrow at B in FIG. 3. Consequently, a delay impulse B appears at the output 51b of flip-flop 51.

Impulse B passes through a differentiating element 52 and an amplifier 53 and is supplied as a short impulse C to the input 54a of a second monostable flip-flop 54. The shape of the impulse is illustrated at C in FIG. 3, and the moment of the impulse is determined by the adjustment of flip-flop 51.

The second monostable flip-flop 54 is also adjustable so that a delayed pulse can be produced. The delayed impulse D is produced at the output 54b, and is illustrated at D in FIG. 3 with a variable rear flank, as indicated by a double arrow.

The output 54b is connected to an emitter 55 and to a differentiating element 61.

Impulse D passes through emitter 55, and an amplifier 56 and appears at the first output 57 of the electric timing device 23 as a working impulse G whose shape and duration is shown at G in FIG. 3.

As explained with reference to FIG. 1, each selector key 1 engages a selector switch 3. A series 32 to 32 is shown in FIG. 2 to be connected to the output 57. An electrically operable means 59, to 59, is connected to each selector switch 32 to 32. All selector switches are connected by a line 58 to output 57 and all electrically operable means 59 to 59, are connected by line 60 to the negative pole of the voltage source.

Since upon actuation of any selector key 1, the corresponding switch 3 is closed before start switch 7 is closed, one of the selector switches 32 to 32 is closed when the impulse G is supplied to line 58. Consequently, an impulse of an exactly determined duration, and starting at an exactly determined moment passes through the electrically operable means 59 whose selector switch 3 was closed, and actuates the respective electrically operable means in a manner which depends in no way on the time which selector key 1 is held depressed and during which the respective selector switch is closed.

The impulse D is also supplied through a differentiating and pulse shaping element 61 and amplified by amplifier 62 to be transformed into an end impulse E which is shown at E in FIG. 3. End impulse E is given when the working impulse G terminates.

Impulse E is supplied to the input 63a of a third monostable flip-flop 63 which is adjustable so that a reset impulse F is produced at the output 63b of flip-flop 63, as shown at F in FIG. 3 where the adjustable duration of the reset impulse F is indicated by a double arrow.

Reset impulse F passes through an emitter 64 and an amplifier 65 to the second output 66 and is supplied as amplified reset impulse H to the electromagnetic control means 6 which is also connected to the negative pole of the voltage source.

Electromagnetic control means 6 is energized so that the armature and lever arm 6c are attracted, and control lever 5 is turned in counterclockwise direction against the action of spring 14 to release locking portion 4c of the locking bar 4.

It will be seen that the variable rear flank of impulse D determines the moment at which the reset impulse starts, while the duration of the reset impulse is determined by adjustment of flip-flop 63.

The circuit may be modified for use with an impulse generator or other means for timing impulses.

**Operation**

When one of selector keys 1 is depressed against the action of spring 11, the corresponding stem 10 moves downward so that pawl 18 engages the lower leg portion 40 of the universal bar 4 which is turned in counterclockwise direction against the action of spring 13 about shaft 40. At the same time, the locking portion 10c of the operated key enters between adjacent balls 20 of the locking device 2 so that the other balls are pressed against each
other and do not permit the entering of another locking portion 10c whereby no other key 1 can be depressed.

During the downward movement of the selected key, shifting portion 10b engages spring 3c of the respective associated selector switch 3 so that two contacts 3b and 3d engage each other so that the circuit of the respective electrical impulse means 59, 59a, 59b, 59c, is prepared, and the output 57 is connected through the respective selector switch and electrically operable means to the negative pole of the voltage source.

During the turning movement of the locking bar 4, control portion 4c moves away from shoulder 5a, permitting spring 14 to pull control lever 5 down so that contacts 10b and 10c are depressed, and in which the upper leg portion 4a of the locking bar 4 engages the top face of the locking projection 10e on the stem 10 of the depressed selector key 1 whereby the same is locked in the actuated position. As long as key 1 remains locked in the depressed position, the respective selector switch 3 remains closed.

During the angular displacement of control lever 5 in counterclockwise direction to lock locking bar 4, its arm 5c displaces spring 7c and closes two contacts 7b and 7d of switch 7 so that connector 7a and one side of the electronic timing device 23.

The impulse A is supplied to flip-flop 51 which produces an impulse B whose rear flank is adjustable so that the duration of the impulse B can be adjusted to exactly determine the time between the moment of closing switch 7 and the time at which the delayed starting impulse C is produced at the output of amplifier 53. This moment determines the beginning of the working impulse II as is apparent from FIG. 3.

The delayed starting impulse C is supplied to flip-flop 54 which produces an impulse D whose duration can be selected by adjustment of flip-flop 54.

The duration of the adjusted impulse D determines the duration of the working impulse G which is obtained by amplification of the impulse D and supplied through output 57 to line 58. One of the selector switches 3, to 3i, is closed, and the working impulse G passes through the closed selector switch and through the electrically operable means 59, to 59j, to the negative pole of the voltage source so that the respective electrically operable means is energized at the moment at which the working impulse starts and for a time period determined by the duration of the working impulse G.

The moment at which the delayed starting impulse C is produced and the time between closing of start switch 7 and impulse C is selected under consideration of the time required for the mechanical movement of the key operated control means shown in FIG. 1.

Since the duration of the working impulse is determined by adjustment of flip-flop 54, the time during which an electrically operable means 59 is energized, is entirely independent of the time during which the operator actually manually depresses a key 1.

The term "electrically operable means" is used in the present application to include any electric load, for example an electromagnetic means for operating a mechanism, such as a type action or other control device of a business machine.

The rear flank of the adjusted impulse D is used for producing by elements 61, 62 an end impulse at the moment at which the working impulse G terminates. End impulse E produces in flip-flop 63 a reset impulse whose duration can be adjusted by adjustment of flip-flop 63. In this manner, an amplified reset impulse H is produced at the output 66 whose duration corresponds to the time required for energizing winding 60 of the electromagnetic control means 6 for the purpose of turning control lever 5 in clockwise direction and holding lever 5 in this position until spring 13 has turned locking bar 4 back to its initial inoperative position whereupon spring 14 pulls control lever 5 down to the position shown in FIG. 1 in which control portion 4c abuts shoulder 5a.

As soon as leg portion 4a of locking bar 4 releases locking projection 10e of the actuated key, the same is raised by the respective spring 11 to its normal position of rest in which projection 10b abuts a portion of guide from 12. 59.

The respective selector switch 3 is released by portion 10b and opens, while locking portion 10c is raised to a position releasing the balls 20 in the locking channel 2 so that another key can be operated.

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 control apparatus differing from the types described above.

While the invention has been illustrated and described as embodied in a key operated control apparatus including a flip-flop circuit for determining start and duration of working impulses controlling operations of electrically operable means of a business machine, such as a typewriter, 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. Electric operation control apparatus, comprising, in combination, a set of selector members; a set of selector switches respectively operated by said selector members; a set of electrically operable means respectively connected with said selector switches; control means operable by each actuated selector member; a start switch actuated by said control means; and an electric timing device having an output connected with said selector switches and an input connected with the start switch, said device being energizable under the control of said start switch for producing at said output a working impulse so that any electrically operable means whose correlated selector member and selector switch are actuated, is energized independently of said selector members.

2. Electric operation control apparatus, comprising, in combination, a set of selector members; a set of selector switches respectively operated by said selector members; a set of electrically operable means respectively connected in series with said selector switches; control means operable by each actuated selector member to move to a control position; a start switch actuated by said control means in said control position; and an electric timing device having an output connected in series with all said selector switches and an input connected with said start switch, said device being energizable under the control of said start switch for producing at said output a working impulse having a predetermined duration so that any electrically operable means whose correlated selector member and selector switch are actuated, is energized for the same time period independently of the actuation time of said selector members.

3. Electric operation control apparatus, comprising, in combination, a set of selector members; a set of selector switches respectively operated by said selector members; a set of electrically operable means respectively connected in series with said selector switches; control means operable by each actuated selector member to move to a control position; a start switch actuated by said control means in said control position; and an electric timing device having an output connected in series with all said
selector switches and an input connected with said start switch, said device being energizable under the control of said start switch for producing at said output a working impulse and including means for adjusting the duration of said impulse so that any electrically operable means whose correlated selector member and selector switch are actuated, is energized for the same time period independently of the actuation time of said selector members.

4. Electric operation control apparatus, comprising, in combination, a set of selector members; a set of selector switches respectively operated by said selector members; a set of electrically operable means respectively connected in series with said selector switches; control means operable by each actuated selector member to move to a control position; a start switch actuated by said control means in said control position; and an electric timing device having an output connected in series with all said selector switches and an input connected with said start switch, said device being energizable under the control of said start switch for producing at said output a working impulse and including means for adjusting the duration of said impulse, and means for adjusting the time between energization of said device and the start of said working impulse so that any electrically operable means whose correlated selector member and selector switch are actuated, is energized for the same time period independently of the actuation time of said selector members.

5. Electric operation control apparatus, comprising, in combination, a set of selector members; a set of selector switches respectively operated by said selector members; a set of electrically operable means respectively connected in series with said selector switches; control means including a locking member operable by each actuated selector member to move to a locking position locking the respective actuated selector member, means urging said locking member to an inoperative position, a control member for locking said locking member in said locking position, and an electric control device for operating said control member to release said locking member; a start switch actuated by said control means in said control position; and an electric timing device having a first output connected in series with all said selector switches, a second output connected with said electric control device, and an input connected with said start switch, said device being energizable under the control of said start switch for producing at said first output a working impulse having a predetermined duration so that any electrically operable means whose correlated selector member and selector switch are actuated, is energized for the same time period independently of the actuation time of said selector members, and for producing at said second output a reset impulse energizing said electric control device to cause release of said locking member so that the actuated selector member is released.

6. Electric operation control apparatus, comprising, in combination, a set of selector members; a set of selector switches respectively operated by said selector members; a set of electrically operable means respectively connected in series with said selector switches; control means including a locking member operable by each actuated selector member to move to a locking position locking the respective actuated selector member, means urging said locking member to an inoperative position, a control member for locking said locking member in said locking position, and an electric control device for operating said control member to release said locking member; a start switch actuated by said control means in said control position; and an electric timing device having a first output connected in series with all said selector switches, a second output connected with said electric control device, and an input connected with said start switch, said device being energizable under the control of said start switch for producing at said first output a working impulse and including means for adjusting the duration of said impulse so that any electrically operable means whose correlated selector member and selector switch are actuated, is energized for the same time period independently of the actuation time of said selector member, and for producing at said second output a reset impulse energizing said electric control device to cause release of said locking member so that the actuated selector member is released.

7. Electric operation control apparatus, comprising, in combination, a set of selector members; a set of selector switches respectively operated by said selector members; a set of electrically operable means respectively connected in series with said selector switches; control means including a locking member operable by each actuated selector member to move to a locking position locking the respective actuated selector member, means urging said locking member to an inoperative position, a control member for locking said locking member in said locking position, and an electric control device for operating said control member to release said locking member; a start switch actuated by said control means in said control position; and an electric timing device having a first output connected in series with all said selector switches, a second output connected with said electric control device, and an input connected with said start switch, said device being energizable under the control of said start switch for producing at said first output a working impulse and including means for adjusting the duration of said impulse, and means for adjusting the time between energization of said device and the start of said working impulse so that any electrically operable means whose correlated selector member and selector switch are actuated, is energized for the same time period independently of the actuation time of said selector member, and for producing at said second output a reset impulse energizing said electric control device to cause release of said locking member so that the actuated selector member is released.

8. Electric operation control apparatus, comprising, in combination, a set of selector members; a set of selector switches respectively operated by said selector members; a set of electrically operable means respectively connected in series with said selector switches; control means operable by each actuated selector member to move to a control position; a start switch actuated by said control means in said control position; and an electric timing device having an output connected in series with all said selector switches and an input connected with said start switch, said device being energizable under the control of said start switch for producing at said output a working impulse and including means for adjusting the duration of said impulse, and means for adjusting the time between energization of said device and the start of said working impulse so that any electrically operable means whose correlated selector member and selector switch are actuated, is energized for the same time period independently of the actuation time of said selector member, and for producing at said second output a reset impulse energizing said electric control device to cause release of said locking member so that the actuated selector member is released.

9. Electric operation control apparatus, comprising, in combination, a set of selector members; a set of selector switches respectively operated by said selector members; a set of electrically operable means respectively connected in series with said selector switches; control means operable by each actuated selector member to move to a control position; a start switch actuated by said control means in said control position; and an electric timing device having an output connected in series with all said selector switches and an input connected with said start switch, said device being energizable under the control of said start switch for producing at said output an impulse and including means for adjusting the duration of said impulse, and means for adjusting the time between energization of said device and the start of said working impulse so that any electrically operable means whose correlated selector member and selector switch are actuated, is energized for the same time period independently of the actuation time of said selector member, and for producing at said second output a reset impulse energizing said electric control device to cause release of said locking member so that the actuated selector member is released.
switches respectively operated by said selector members; a set of electrically operable means respectively connected in series with said selector switches; control means including a locking member operable by each actuated selector member to move to a locking position locking the respective selector member, means urging said locking member to an inoperative position, a control member for locking said locking member in said locking position, and an electric control device for operating said control member to release said locking member; a start switch actuated by said control means in said control position; and an electronic timing device having a first output connected to all said selector switches, a second output connected with said electric control device, and an input connected with said start switch, said device being energizable under the control of said start switch for producing at said first output a working impulse, and including a first monostable flip-flop connected with said start switch and being adjustable for setting the time between the operation of said start switch and the start of said working impulse, a second monostable flip-flop connected with the output of said first flip-flop and adjustable for determining the duration of said working impulse, and thereby the time during which said control device is energized.

12. An electric operation control apparatus comprising, in combination, a set of selector key means, each key means including a stem, a pivot carried by said stem, a pawl mounted on said pivot, and a first spring urging said pawl to a normal position, each stem having a locking portion and an engaging portion, a stationary frame supporting said stems for movement between a position of rest in which said engaging portion abuts said guide frame, and an actuated position; spring means for urging said key means to said position of rest; a set of selector switches engaged and operated by the engaging portion of the respective key means so as to close the corresponding key means is moved to said actuated position; a set of electrically operable means respectively connected in series with said selector switches; control means including a locking bar extending across said stems and cooperating with said paws, said locking bar being mounted for turning movement between an inoperative position and a locking position engaging said locking portion of a key means in said actuated position, spring means urging said locking bar to said inoperative position, a control lever for locking said locking bar in said locking position, and an electromagnetic means for operating said control lever to release said locking bar, said locking bar being moved to said locking position by said pawl of any actuated key means so that the respective actuated key means is locked and holds the respective selector switch in closed position; a start switch actuated by said control lever when the same locks said locking bar; and an electric timing device having a first output connected in series with all said selector switches, a second output connected with said electromagnetic means, and an input connected with said start switch, said device being energizable under the control of said start switch for producing at said first output a working impulse having a predetermined starting time and duration so that any electrically operable means whose correlated selector switch and selector key means are actuated, is energized for the same time period independently of the actuation time of said selector member, and for producing at said second output a reset impulse energizing said electromagnetic means to cause release of said locking bar so that the actuated selector key is released and returns to its position of rest.

13. An apparatus as set forth in claim 12 wherein said control lever is a double armed lever having one arm formed as an armature of said electromagnetic means, and having another arm formed with stepped shoulders cooperating with said locking bar in said inoperative and locking positions, and including a spring acting on said control lever to urge the same toward said locking bar so that said electromagnetic means upon energization thereof turns said control lever to a position releasing said locking bar.

14. An apparatus as set forth in claim 12 wherein said locking bar has a U-shaped cross section with a first and a second leg portion and forms a cavity; wherein said paws are at least partly located in said cavity and press against said first leg portion during movement of a key means to said actuated position, and wherein said second leg portion engages said locking portion of an actuated key means.

15. An apparatus as set forth in claim 12 comprising a locking device including a closed channel, and a row of balls in said closed channel, said channel having spaced slots; and wherein said stems have locking portions registering with said slots, respectively; and wherein said locking portion of the stem of an actuated key means is located in said channel between said balls so that said locking portions of the other key means cannot enter said channel.

16. An electric operation control apparatus comprising, in combination, a set of selector key means, each...
key means including a stem, a pivot carried by said stem, a pawl mounted on said pivot, and a first spring urging said pawl to a normal position, each stem having a locking portion and an engaging portion, a stationary frame supporting said stems for movement between a position of rest in which said engaging portion abuts said guide frame, and an actuated position; spring means for urging said key means to said position of rest; a set of selector switches engaged and operated by the engaging portion of the respective key means so as to close when the corresponding key means is moved to said actuated position; a set of electrically operable means respectively connected in series with said selector switches; control means including a locking bar extending across said stems and cooperating with said pawls, said locking bar being mounted for turning movement between an inoperative position and a locking position engaging said locking portion of a key means in said actuated position, spring means urging said locking bar to said inoperative position, a control lever for locking said locking bar in said locking position, and an electromagnetic means for operating said control lever to release said locking bar, said locking bar being moved to said locking position by said pawl of any actuated key means so that the respective actuated key means is locked and holds the respective selector switch in closed position; a start switch actuated by said control lever when the same locks said locking bar; and an electronic timing device having a first output connected in series with all said selector switches, a second output connected with said electromagnetic means, and an input connected with said start switch, said device being energizable under the control of said start switch for producing at said first output a working impulse, and including a first monostable flip-flop having an input connected with said start switch and being adjustable for setting the time between the operation of said start switch and the start of the working impulse, a second monostable flip-flop connected with the output of said first flip-flop and adjustable for determining the duration of said working impulse, and a third monostable flip-flop having an output connected with said second output, the output of said second flip-flop being connected with said first output of said timing device and with the input of said third monostable flip-flop so that any electrically operable means whose correlated selector switch is closed by the correlated actuated selector key means, is energized for the same time period independently of the actuation time of said selector key means, and so that at said second output, a reset impulse is produced for energizing said electromagnetic means to cause release of said locking bar so that the actuated selector key is released and returns to its initial position.

17. An apparatus as set forth in claim 16 wherein said third monostable flip-flop is adjustable for determining the duration of said reset impulse and thereby the time during which said electromagnetic means is energized.

18. An apparatus as set forth in claim 17 and including means between the output of said first flip-flop and the input of said second flip-flop for producing a short starting impulse which is supplied to said second monostable flip-flop.

19. An apparatus as set forth in claim 18 and including means between the output of said second monostable flip-flop and the input of said third monostable flip-flop for producing a short end impulse controlling the start of the reset impulse.

20. An apparatus as set forth in claim 16 wherein said electrically operable means are electromagnetic means for moving elements of a business machine.

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