

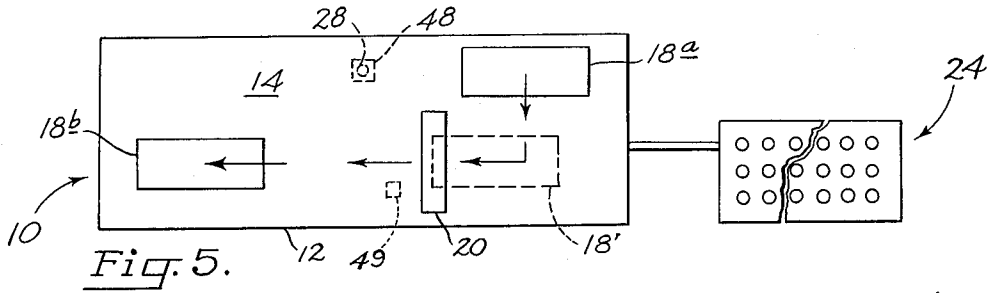
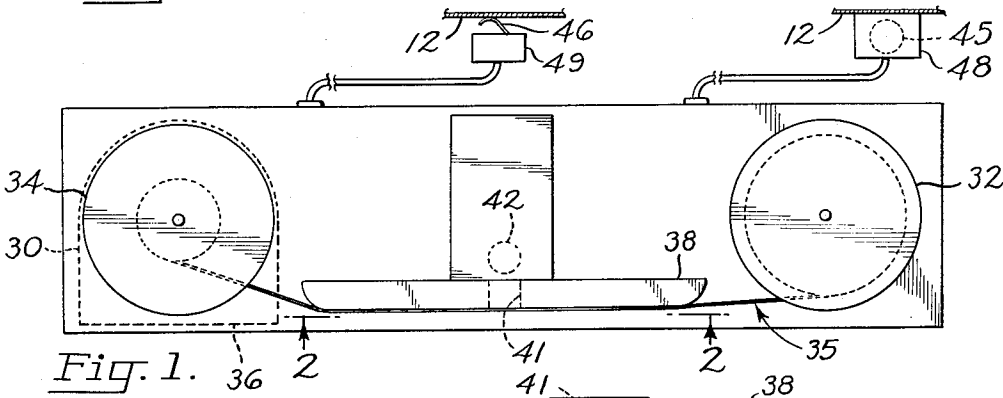
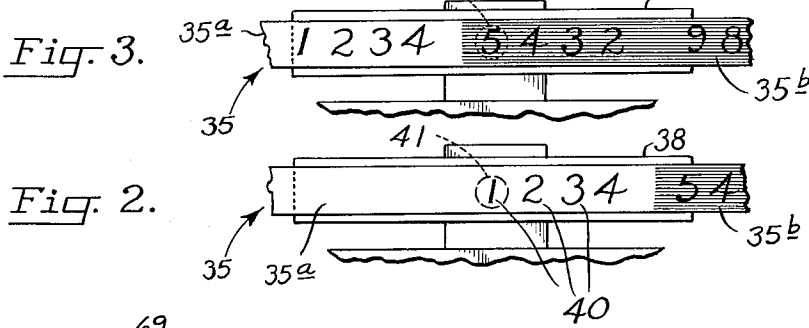
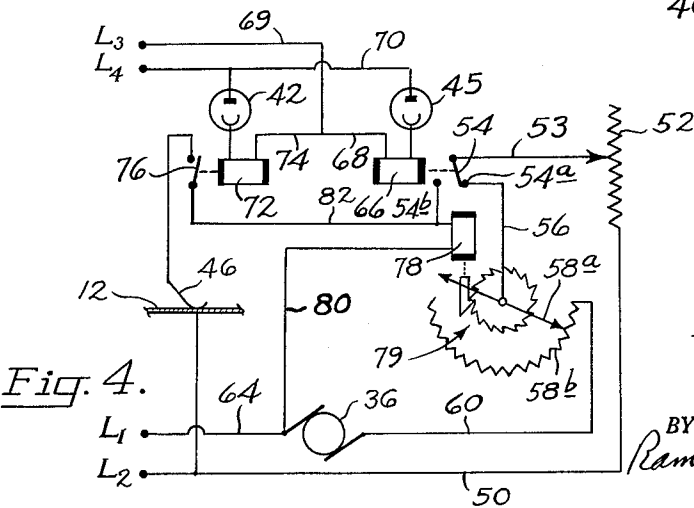
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KEYPUNCH TRAINING MACHINE

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KEYPUNCH TRAINING MACHINE

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This invention relates to apparatus for conditioning the responses of a multiple selector machine operator. More particularly, this invention concerns apparatus for training the responses of an operator of a finger-actuated keyboard. Exemplary of such operators are the operators of a key punch machine, where an operator is required to actuate or stroke the keys of a keyboard in a manner determined by the information that it is desired to have recorded by the operator.

By way of introduction, a key punch machine is a common piece of data processing equipment. With such a machine, a key punch operator strokes or actuates selected keys on a keyboard, with such actuation resulting in the production of punches in a card. In using such a machine, the speed and accuracy of an operator is of importance.

It has been found that a human being gains a certain proficiency with a machine such as a key punch machine, through familiarity, and by repeated use. It has also become apparent to applicant that familiarity and repeated use does not by itself, result in maximum efficiency. Apparently error patterns tend to be repeated, and an operator's performance tends to become established at a certain level, which remains substantially without change and is below the ultimate that could be realized were an operator subjected to a training exercise that challenged his or her utmost skill. Thus, it has been found that if an operator is trained by continuously urging more rapid performance, while noting any errors made thus to urge discontinuance of the errors, habits are developed that promote a proficiency considerably above that resulting where a normal work load is relied upon to produce skill in operation.

In data processing and using a key punch machine, as already indicated, an operator strokes the keys of a keyboard with such resulting in the recording of information through punches on a card. After a card has been punched, it is a conventional practice to have the card analyzed in a "verifier" for the purposes of checking the card to see if it has been punched correctly. The usual verifier has a keyboard similar to the keyboard of the key punch machine. It also has a scanning device, that scans a card as the card travels by steps through the machine and notes punches in the card. In using a verifier, an operator is supposed to actuate keys in the verifier keyboard corresponding to the punches in the cards being checked. If a key actuation is made, and the scanning device in the verifier notes a discrepancy between the key actuated and the punch on a card that is supposed to correspond, a warning device in the verifier, such as a light, is actuated, signaling the discrepancy. The operator of the verifier then has an opportunity to see if the error was made in the original punching of the card, or in actuating the particular key in the verifier. If no discrepancies are noted in a card on its passage through the verifier scanning device, it is assumed that the information recorded on the card is correct. This invention in a more specific sense contemplates training apparatus that may be used in conjunction with such a verifier, for the purpose of speeding up and improving the accuracy of a keyboard operator.

An object of the invention, therefore, is to provide novel training apparatus which may be used to increase

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the speed and accuracy with which selections are made in a multiple selector device, such as a keyboard.

Another object is to provide such apparatus, which may be produced as a relatively compact unit, and at a relatively low cost. The apparatus thus is well suited for wide spread distribution.

More specifically, it is an object of this invention to provide training apparatus, for conditioning the responses of a trainee, which includes a recorded means or tape, having an array of digits, letters, or other symbolic stimuli marked or recorded thereon; a presentation station where a portion of these digits are presented or displayed to the trainee; and means for moving the recorded means or tape through the presentation at a progressively increasing speed. When using the apparatus, a trainee selects and actuates the keys in the keyboard of a machine such as a verifier corresponding to the digits presented, and the apparatus functions to press continuously the trainee to make faster and more accurate actuations.

A further feature and object of the invention is to provide such apparatus, that includes an error sensor, and also a lag detection system, both of which are operable, when actuated, to produce a step-down in the speed at which the tape travels through the presentation station. The error sensor is actuated when a trainee makes an error in his selection, and the lag detection system is actuated when a trainee's performance lags behind that required to keep up with the moving tape.

The device contemplated by the invention may be used for training purposes without extensive supervision. The device automatically, and without outside control, adjusts itself to the capabilities of a trainee.

These and other objects and advantages are attained by the invention, and the same is described hereinbelow in conjunction with the accompanying drawings, wherein:

FIG. 1 is a view illustrating an embodiment of the apparatus contemplated by the invention, such apparatus including a pair of spaced spools, and a tape extending between the spools;

FIG. 2 is a view, taken generally along the line 2-2 in FIG. 1, showing portions of the tape in the apparatus, and an array of digits thereon;

FIG. 3 is a view similar to FIG. 2, but showing the tape in another position;

FIG. 4 illustrates, diagrammatically, an electrical circuit in the apparatus; and

FIG. 5 is a view illustrating, on a reduced scale and in somewhat simplified form, a conventional type of verifier, such including a keyboard, and means for scanning a punched card as the same is advanced step-wise through the machine.

Referring now to the drawings, and first of all to FIG. 5, here there is illustrated, in somewhat simplified form, a conventional type of verifier 10 used to analyze punched cards. The verifier includes a casing 12, having a front 14 which punched cards are mounted on and travel over while being scanned.

A stack of punched cards stored in readiness for scanning is indicated at 18a. The machine includes mechanism (not shown) that is operable to draw out one card at a time from stack 18a and shift it in the path indicated by the arrows to a stack indicated at 18b. A scanning device is indicated at 20, that is operable to determine the location of punches on a card. A card in the position of the card indicated at 18' occupies the position of a card when scanning thereof is first started.

A typical card may have, for example, some 80 columns laid out thereon following one another along the length of the card, and each extending across the card. Each column includes plural spaces for receiving a punch, typically twelve. In punching a card, an operator of a

key punch machine actuates certain keys, the keys selected depending upon the information it is desired to record, with such producing appropriate punches in selected columns of a card. In the verifier just described, the locations of such punches in a card may be determined by the scanning device 20.

Also part of the verifier is a keyboard 24 provided with keys 26. The keys are electrically connected to circuits within casing 12 of the verifier. To check the accuracy of punches on a card, an operator of the verifier is supposed to actuate keys 26 of the verifier in the same way that the keys of the key punch machine should have been actuated when punching the card originally. If no mistake has been made, each time a key is punched in the verifier, scanning device 20 determines that this key corresponds to a punch in the card, and the card is moved forwardly to a position where the next punch may be checked. If, however, an operator punches a key 26 which does not correspond to a punch in the card, then there is a discrepancy (caused by the operator making a mistake in the key selected in the verifier, or a mistake in the key selected when punching the card originally) and the verifier indicates this discrepancy by stopping forward movement of the card and energizing a lamp 28. Lamp 28 constitutes a discrepancy signaler in the verifier.

In the verifier, a card is moved step-by-step past the scanning device, with all of its columns being checked. Thence it is shifted to stack 18b and a succeeding card is moved to the position of card 18' to prepare the card for checking of any punches therein.

Referring now to FIG. 1, here a top view of apparatus embodying the invention is illustrated. The apparatus as shown comprises a casing 30. Mounted on top of the casing, and to one side thereof, is a spool 32. Also mounted on top of the casing, and on the other side thereof, is another spool 34. Spool 32 has multiple windings of an elongated tape 35 wound thereon. During operation of the device, the tape is removed from spool 32 and collected by winding it up on spool 34, with the tape traveling in the direction indicated by the arrow in FIG. 1.

Spool 34 is rotated, under power, with the tape winding up on the spool, by means of a motor such as the one indicated in FIG. 1 at 36. Motor 36 may be a direct current electric motor, the speed of which is changed by adjusting the supply of electric current fed thereto.

Between spools 32, 34 is a viewing board 38. Tape on traveling from spool 32 to spool 34 slides over the board, and a trainee standing in front of the apparatus views the tape, as the same is illustrated in FIGS. 2 and 3, with the tape lying flat against the board. The board constitutes a presentation station in the apparatus.

Tape 35 has an array of symbolic stimuli, more specifically digits 40, marked thereon and appearing along the length of the tape. These are displayed to a trainee as the tape moves across board 38. For each digit, there is a key 26 in keyboard 24 of the verifier which corresponds to the digit. In using the training apparatus, typically a trainee is instructed to actuate keys 26 of the verifier corresponding to the digits that are moved into view as the tape moves across board 38, in the order that such digits come into view.

Mounted in back of board 38, to the rear of an aperture 41 in the board, and covered by the tape as the tape travels over the board, is a photoelectric cell 42. The cell is conventional and constitutes a light-sensitive device in the apparatus. When light falls on the photoelectric cell, it becomes conductive, and in the absence of light the cell is nonconductive. The photoelectric cell is part of a lag-detection system or detecting means in the apparatus, that is actuated when a trainee lags or falls behind in his or her reading of the symbols on the tape and actuation of the appropriate keys 26, as will be described.

Tape 35 includes a number of sections that are pervious to light distributed along the length thereof. One of

such sections is shown in FIGS. 2 and 3 at 35a. In FIG. 2 a light-pervious section 35a is over aperture 41 exposing photoelectric cell 42, and with the tape in this position light from a room passes through the tape and actuates the photoelectric cell whereby it becomes conductive. Interspersed with the light-pervious sections along the length of the tape are opaque sections that are non-pervious to light, and one of these is indicated at 35b. In FIG. 3 an opaque section 35b extends over aperture 41, and photoelectric cell 42 is shielded from room light. Thus, with the tape in this position the photoelectric cell is nonconductive. The light-pervious and opaque sections are also part of the lag-detection system.

When the apparatus of this invention is used for training purposes, it is connected to a verifier, such as verifier 10, so as to be responsive to actuation of lamp 28 (the discrepancy signaler) by the verifier, and the travel of cards past scanning device 20. This responsiveness to actuating of lamp 28 is obtained by means of a photoelectric cell 45. The responsiveness to the travel of cards past scanning device 20 is obtained by a switch 46. Switch 46 is also part of the lag detection system or detecting means in the apparatus.

More specifically, and referring to FIG. 1, photoelectric cell 45 is mounted within a shield attachment 48. As will be explained, the cell is part of the electrical circuit for the training apparatus. With the training apparatus connected to a verifier, shield attachment 48 is mounted on the casing of the verifier in the general position of the dashed outline 48 in FIG. 5, with cell 45 over lamp 28. Thus, with the lamp illuminated the cell is made conductive, and with the lamp extinguished the cell becomes nonconductive.

Considering switch 46, the switch is mounted in a housing 49 and is part of the electrical circuit for the training apparatus. With the training apparatus connected to a verifier, housing 49 is mounted on the casing of the verifier 10 on the outfeed side of scanning device 20, in the general position of the dashed outline 49 in FIG. 5. With the housing 50 mounted, switch 46 is in a position for contacting a card traveling from the scanning device. In the usual verifier, each time that a new card is positioned to start past the scanning device (in the position of card 18' in FIG. 5), the preceding card is moved completely past the scanning device and stacked. At this time, therefore, there is no portion of any card under switch 46, and the switch contacts the metal of casing 12 to produce closing of the switch. As the new card is advanced stepwise through scanning device 20, it moves under switch 46 and lifts the switch from off the casing of the verifier, thus to produce opening of the switch.

Reference is now made to FIG. 5, where the electrical circuit for the apparatus is illustrated.

As can be seen in this figure, motor 36 is supplied direct current by line conductors L₁ and L₂. Line conductor L₂ is connected to one side of motor 36 through a conductor 50, a rheostat 52, a conductor 53, a switch blade 54, switch contact 54a, a conductor 56, a stepping switch arm 58a, a stepping switch resistor 58b, and a conductor 60. Line conductor L₁ is connected to the other side of motor 36 through a conductor 64.

Switch 54 just mentioned is ganged to a solenoid 66, connected at one end through conductors 68, 69 to one of a pair of line conductors L₃. The other end of solenoid 66 is connected through photoelectric cell 45 and a conductor 70 to the other of the pair of line conductors L₄. On photoelectric cell 45 conducting current, solenoid 66 is energized, and switch blade 54 is shifted off of contact 54a and against switch contact 54b.

Photoelectric cell 42, which is part of the lag-detection system, when energized, completes a circuit between line conductor L₄ and one end of a solenoid 72. The other end of solenoid 72 is connected by a conductor 74 and conductor 69 to line conductor L₃. Solenoid 72 is ganged

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to a switch 76, and opens the switch when energized, with the switch closing on deenergizing of the solenoid.

At 78 there is indicated a solenoid ganged to mechanism 79 for shifting stepping switch arm 58a. When solenoid 78 is energized, arm 58a is shifted along a portion of the length of the stepping switch resistance to increase the resistance in the circuit supplying electric motor 36. One end of solenoid 78 is connected to line conductor L₁ through a conductor 80. The other end of solenoid 78 is connected through a conductor 82, switch 76 (when closed) and switch 46 (when closed) to line conductor L₂.

When using the apparatus for training purposes, initially a stack of punched cards is placed on the verifier, at the location of stack 18a, such cards having been prepared with punches corresponding to the digits appearing on tape 35. If the verifier and training apparatus are now turned on, motor 36 becomes energized, and tape 35 is drawn across board 38 with successive digits thereon moving into view of the trainee.

As the tape moves, the trainee actuates keys 26 corresponding to the digits on the tape. In the absence of any errors by the trainee, or any falling behind by the trainee, motor 36 runs at a constant speed. This produces a progressively increasing speed in the movement of the tape across board 38, since as windings of tape are collected on spool 34, the diameter of each winding increases. The apparatus therefore continuously urges the trainee into making progressively more rapid key selections as the tape and the digits marked thereon move across his or her view.

Let it now be assumed that the trainee makes an error in the selection of a key, i.e., actuates a key in keyboard 24 not corresponding to the digit presented to him. When this occurs, lamp 28 of the verifier illuminates, through normal operation of the scanning device in the verifier which notes a discrepancy between the key punched and the corresponding punch in a card. On lamp 28 illuminating, photoelectric cell 45 becomes conductive, causing solenoid 66 to become energized. As a result, the circuit to motor 36 is opened, and the motor stops. At the same time, solenoid 78 is energized to produce actuation of stepping switch mechanism 79. Upon stepping switch mechanism 79 being actuated, a greater proportion of the stepping switch resistance is placed in the circuit supplying motor 36.

On the trainee noting the error and actuating the correct key in keyboard 24, lamp 28 goes out, photoelectric cell 45 becomes nonconductive, solenoid 78 is deenergized, and the circuit supplying motor 36 is again closed. The motor, as a result, starts to run again, but at a somewhat slower speed. With the motor running, the tape is again moved across board 38 and at a progressively increasing speed.

Explaining now the operation of the lag-detection system, this operates each time that a new card travels into scanning device 20. It will be remembered that when this happens, the card preceding is moved into stack 18b, and thus at this time switch 46 contacts the casing of the verifier to close the switch. With switch 46 closed, the lag-detection system will or will not function, depending upon whether cell 42 is conductive or nonconductive.

First of all it will be assumed that the trainee is not lagging, and is reading the digits as they move to the center of board 38. Reference is now made to FIG. 2, which illustrates the condition of the tape when the trainee is not lagging, and it is intended that the trainee should actuate the number "1" key. Note that the digit "1" appears on a previous section of the tape, which is centrally located on board 38 over aperture 41. With such conditions existing, photoelectric cell 42 responds to room light passing through the light-pervious portion of the tape, and is conductive. With cell 42 conductive, solenoid 72 is energized, and switch 76 is open. Thus, even though switch 46 is closed, the circuit supplying solenoid 78 is open, and thus nothing happens to motor 36.

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Had the trainee been falling behind, he or she would be preparing to punch the number "1" key when the portion of the tape with the number "1" thereon was off to the left of the board as shown in FIG. 3. With the tape positioned as is in FIG. 3, an opaque portion of the tape is over aperture 42 and the photoelectric cell, and the cell is rendered nonconductive. With reference to FIG. 4, this results in solenoid 72 being deenergized and switch 76 being closed. With switch 76 closed, a closed circuit results for solenoid 78. This causes mechanism 79 to be actuated causing the arm of the step-down switch to move in a direction increasing the resistance in the circuit supplying motor 36. The motor, while running continuously, has its speed stepped down. As a card advances into switch 46, the switch is opened and solenoid 78 deenergized.

It will be noted, in summary, that a training device is contemplated requiring little, if any, supervision. The apparatus automatically adjusts itself to the capabilities of the particular trainee. With both the average and the more proficient trainee, the operation of the apparatus is similar, in that with both, as the tape travels its speed increases, with a step-down in its speed occurring when an error or lagging response is noted.

It is appreciated that only one embodiment of the invention has been described. Variations are possible, and it is intended to cover all such variations that are apparent to one skilled in the art, and that come within the scope of the following claims.

It is claimed and desired to secure by Letters Patent:

1. Training apparatus for conditioning the responses of an operator of a multiple selector machine comprising recorded means having an array of symbolic stimuli recorded thereon, a presentation station for presenting a portion of said means and the stimuli recorded thereon to an operator, an accelerating motion producer operatively connected to said recorded means and operable to move portions of said recorded means through said presentation station at a progressively increasing speed, an error sensor, and means connecting said error sensor and motion producer operable when actuated to step down movement of the recorded means through said presentation station by said accelerating motion producer.

2. Training apparatus for conditioning the responses of an operator of a multiple selector machine comprising recorded means having an array of symbolic stimuli recorded thereon, a presentation station for presenting a portion of said recorded means to an operator with such portion having a series of stimuli recorded thereon, an accelerating motion producer operatively connected to said recorded means and operable to move said recorded means through said presentation station at a progressively increasing speed, movement of said recorded means through said station resulting in changes in the series of the stimuli of the recorded means presented to the operator, detecting means for detecting the discrete stimulus to which an operator is responding in a series, and means connecting said detecting means and motion producer for slowing down movement of said recorded means when said detecting means notes lagging in an operator's responses.

3. Training apparatus for conditioning the responses of an operator of a multiple selector machine comprising recorded means having an array of symbolic stimuli recorded thereon, a presentation station for presenting a portion of said recorded means to an operator with such portion having a series of stimuli recorded thereon, an accelerating motion producer operatively connected to said recorded means and operable to move said recorded means through said presentation station at a progressively increasing speed, movement of said recorded means through said station resulting in changes in the series of the stimuli of the recorded means presented to the operator, detecting means for detecting the discrete stimulus to which an operator is responding in a series, an error

sensor for noting operator error, and means operatively connecting said detecting means and error sensor with said motion producer whereby actuation of the error sensor and detecting means controls movement produced by said motion producer.

4. Apparatus for conditioning the responses of an operator of a multiple selector machine comprising an elongated tape having an array of symbolic stimuli recorded along the length thereof, a presentation station for displaying the stimuli recorded on said tape to an operator, means for drawing said tape through said presentation station with successive ones of said stimuli being displayed to an operator, said means having an accelerating factor whereby the tape is drawn through said presentation station at a progressively increasing speed, an error sensor for noting operator error, and means connecting said error sensor and the means for moving said tape operable to produce a step down in the movement of said tape through said presentation station upon actuation of said error sensor.

5. Apparatus for conditioning the responses of an operator of a multiple selector machine comprising an elongated tape having an array of symbolic stimuli recorded along the length thereof, a presentation station for displaying the stimuli recorded on said tape to an operator, means for drawing said tape through said presentation station with successive ones of said stimuli being displayed to an operator, said means having an accelerating factor whereby the tape is drawn through said presentation station at a progressively increasing speed, step-down means operable when actuated to produce a decrease in the movement produced by said means for drawing the tape through said presentation station, an error sensor, detecting means for detecting the discrete stimulus to which an operator is responding in a series, and means connecting said detecting means and error sensor to said step down means whereby actuation of either actuates the step-down means and reduces the movement of said tape.

6. In combination with a punch card verifier having a keyboard with keys for operating the verifier, scanning means for scanning a punched card and determining punch locations therein, and a discrepancy signaler that operates when an operator actuates a key on the keyboard not corresponding to a punch in a card as determined by said scanning means; apparatus for conditioning operator response comprising recorded means having an array of symbolic stimuli recorded thereon, a presentation station for presenting a portion of said recorded means and the stimuli recorded thereon to an operator, an accelerating motion producer operable to move portions of said recorded means through said presentation station at a progressively increasing speed, step-down means for said motion producer operable when actuated to produce a step-down in the movement of the recorded means produced thereby, and means connecting said step-down means and said discrepancy signaler whereby the former operates in response to the latter.

7. In combination with a punch card verifier machine having a keyboard with keys for operating the verifier, scanning means for scanning a punched card and determining punch locations therein, and a discrepancy signaler that operates when an operator actuates a key on the keyboard not corresponding to a punch in a card as determined by said scanning means; apparatus for conditioning operator response comprising a tape having an array of symbolic stimuli recorded thereon, a presentation station for presenting a portion of said tape and the stimuli recorded thereon to an operator, a mover for moving said tape through said presentation station whereby a changing series of the stimuli on said tape are presented to an operator, detecting means for detecting the discrete stimulus to which an operator is responding in a series, step-down means operatively connected to said mover for producing a step-down in the movement of the tape, and means operatively connecting said step-

down means with said detecting means and said discrepancy signaler of said verifier whereby the detecting means and signaler control the step-down means.

8. Training apparatus for conditioning the responses of a trainee in making key selections in a keyboard comprising a tape with an array of symbolic stimuli recorded thereon along the length thereof, a station for viewing the tape, means for holding a supply of said tape on one side of said station, a spool for collecting tape on the other side of said station with tape traveling onto said spool moving across said station, motor means for rotating said spool at a rate whereby tape moves across said station at a progressively increasing speed, step-down means for stepping-down the rotation speed of said spool produced by said motor means, and means for actuating said step-down means including one means that responds to an error in key selection by the trainee, and one means that responds to a lag in response to stimuli presented to the trainee.

9. Training apparatus for teaching an operator skill in operating a multiple selector machine comprising recorded means having an array of symbolic stimuli recorded thereon, a presentation station for presenting a portion of said means and the stimuli recorded thereon to the operator, a motion producer operable to move successive portions of said recorded means through said presentation station, an error sensor operable to note operator error, and means connecting said error sensor and motion producer operable upon actuation of the error sensor to adjust the motion producer so as to slow down the speed with which successive stimuli on said recorded means are presented to an operator in said presentation station.

10. Training apparatus for teaching an operator skill in operating a multiple selector machine comprising recorded means having an array of symbolic stimuli recorded thereon, a presentation station for presenting a portion of said recorded means and the stimuli recorded thereon to the operator, a motion producer operable to move successive portions of said recorded means through said presentation station thus to present to the operator successive portions of the stimuli recorded on said recorded means, lag detecting means operable to detect whether an operator is lagging in his responses to the stimuli presented in said presentation station, and means connecting said lag detecting means and motion producer operable on actuation of the lag detecting means to adjust the motion producer so as to slow down the speed with which successive stimuli on said recorded means are presented to an operator in said presentation station.

11. The training apparatus of claim 10, which further comprises an error sensor operable to note operator error, and means connecting the error sensor and motion producer operable upon actuation of the error sensor to adjust the motion producer so as to slow down the speed with which successive stimuli on said recorded means are presented to an operator in said presentation station.

12. Training apparatus comprising a tape having interspersed opaque and light pervious sections distributed in a row along the length of the tape, an array of symbolic stimuli recorded on the tape and distributed in a row along the length of the tape and together with said opaque and light pervious sections, a presentation station for displaying the tape, a light-sensitive device mounted in said presentation station, means for moving said tape through the presentation station with said row of opaque and light pervious sections operable to control the amount of light falling on said light-sensitive device, switch means operatively connected to light-sensitive device and actuated by a change in the type of tape section controlling said light-sensitive device, motor operated means for moving the tape through the presentation station, said motor operated means including motor control means that is actuable to slow down tape movement, and means connecting said switch means and said motor control means whereby

actuation of the switch means results in slowing down of the movement of the tape.

13. In combination with a punch card verifier machine having a keyboard with keys for operating the verifier, scanning means for scanning a punched card and determining punch locations therein, and means for moving punched cards on the verifier machine one after another through said scanning means; apparatus for conditioning operator response comprising a tape having interspersed opaque and light pervious sections distributed in a row along the length thereof, said tape also having an array of symbolic stimuli recorded thereon and distributed in a row along the length of the tape together with said opaque and light pervious sections, a presentation station for displaying the tape, means for moving the tape through the presentation station, a light-sensitive device actuated by changes in light mounted in said presentation station and controlled by the type of tape section moving through the presentation station, switch means connected

to said light-sensitive device and actuated by a change in the type of tape section in said presentation station, another switch means actuated by the movement of cards on said verifier machine, motor operated means for moving said tape through said presentation station and including motor control means that is actuatable to slow tape movement, and means connecting both of said switch means to said motor control means whereby both switch means control the speed of tape movement.

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