Nov. 23, 1965 K. D. J. GROSVENOR ETAL 3,218,921

APPARATUS FOR PRESENTING INFORMATION

Filed March 12, 1963 4 Sheets-Sheet 1

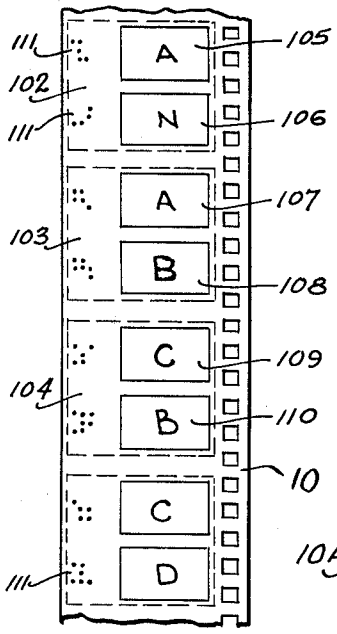

Fig. 1.

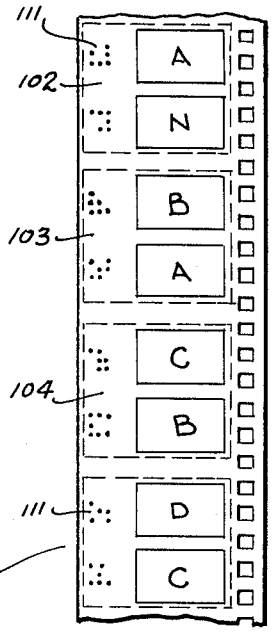

Fig. 2.

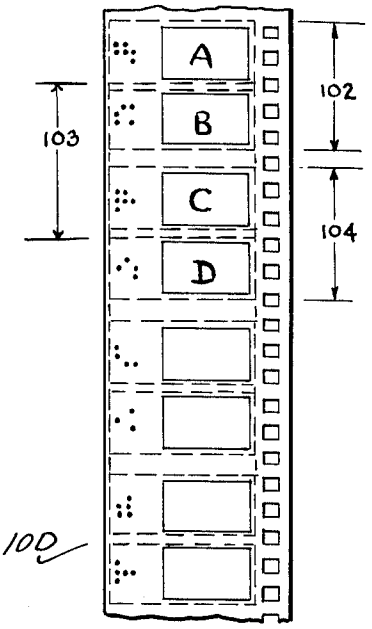

Fig. 2a.

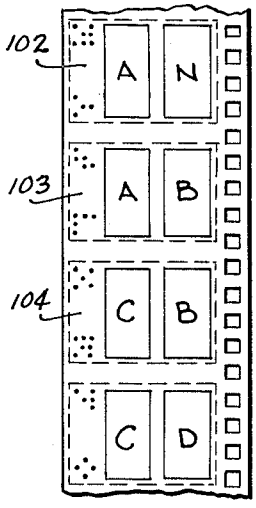

Fig. 3.

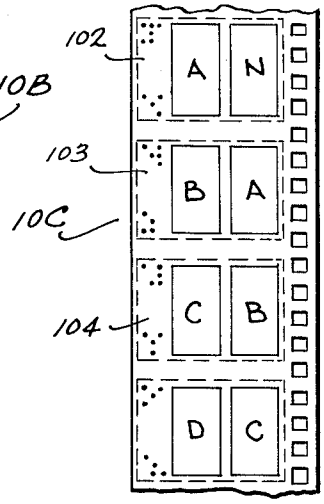

Fig. 4.

Inventors
Kenneth D J Grosvenor
Maurice M Levy
By Stevens, Davis, Miller & Mosher
Attorneys

Nov. 23, 1965 K. D. J. GROSVENOR ETAL 3,218,921

APPARATUS FOR PRESENTING INFORMATION

Filed March 12, 1963 4 Sheets-Sheet 2

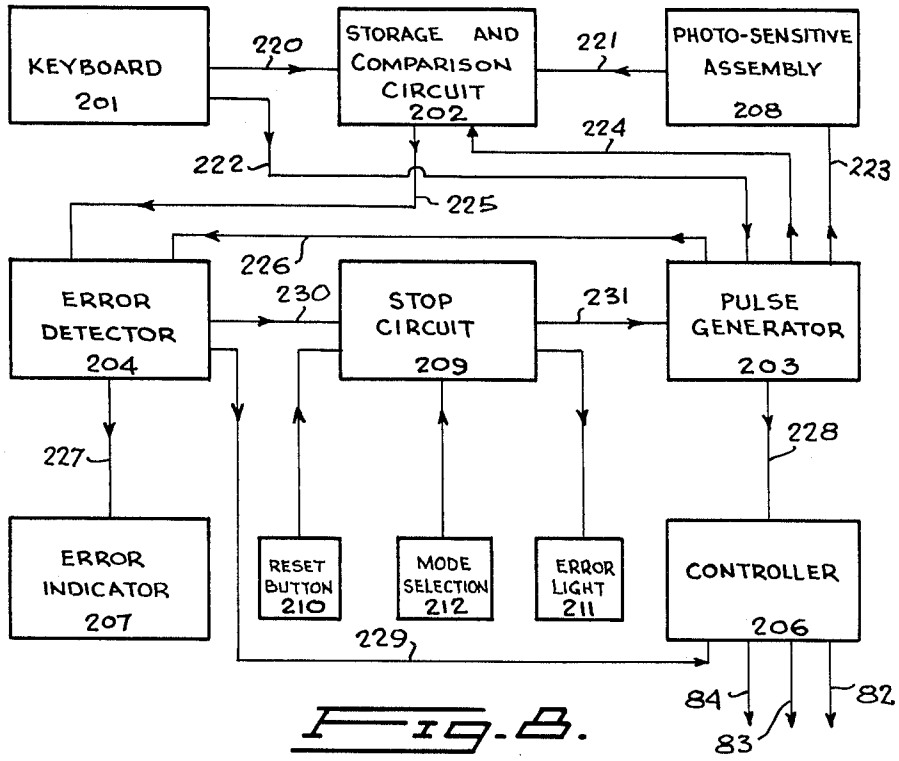

Fig. 8.

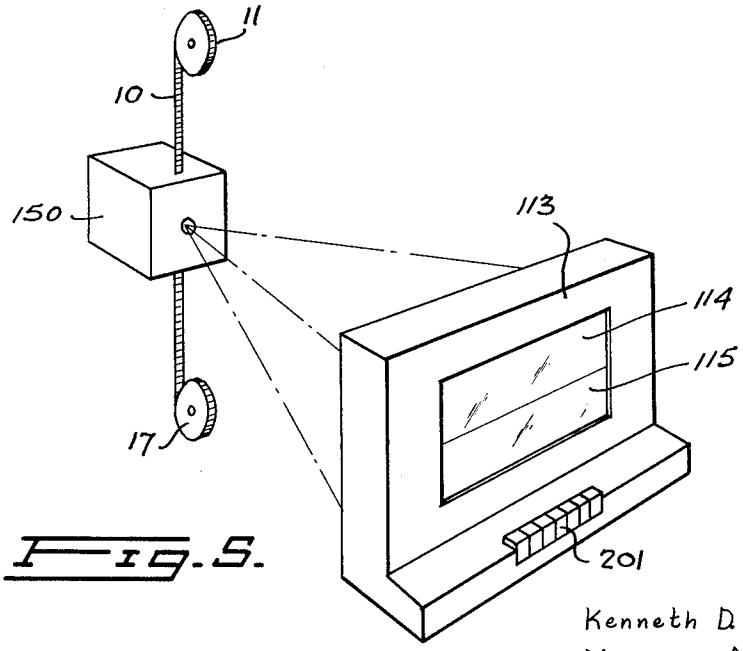

Fig. 5.

Inventors
Kenneth D. J. Grosvenor
Maurice M. Levy
By Stevens, Davis, Miller & Mosher
Attorneys

Nov. 23, 1965 K. D. J. GROSVENOR ETAL 3,218,921

APPARATUS FOR PRESENTING INFORMATION

Filed March 12, 1963 4 Sheets-Sheet 3

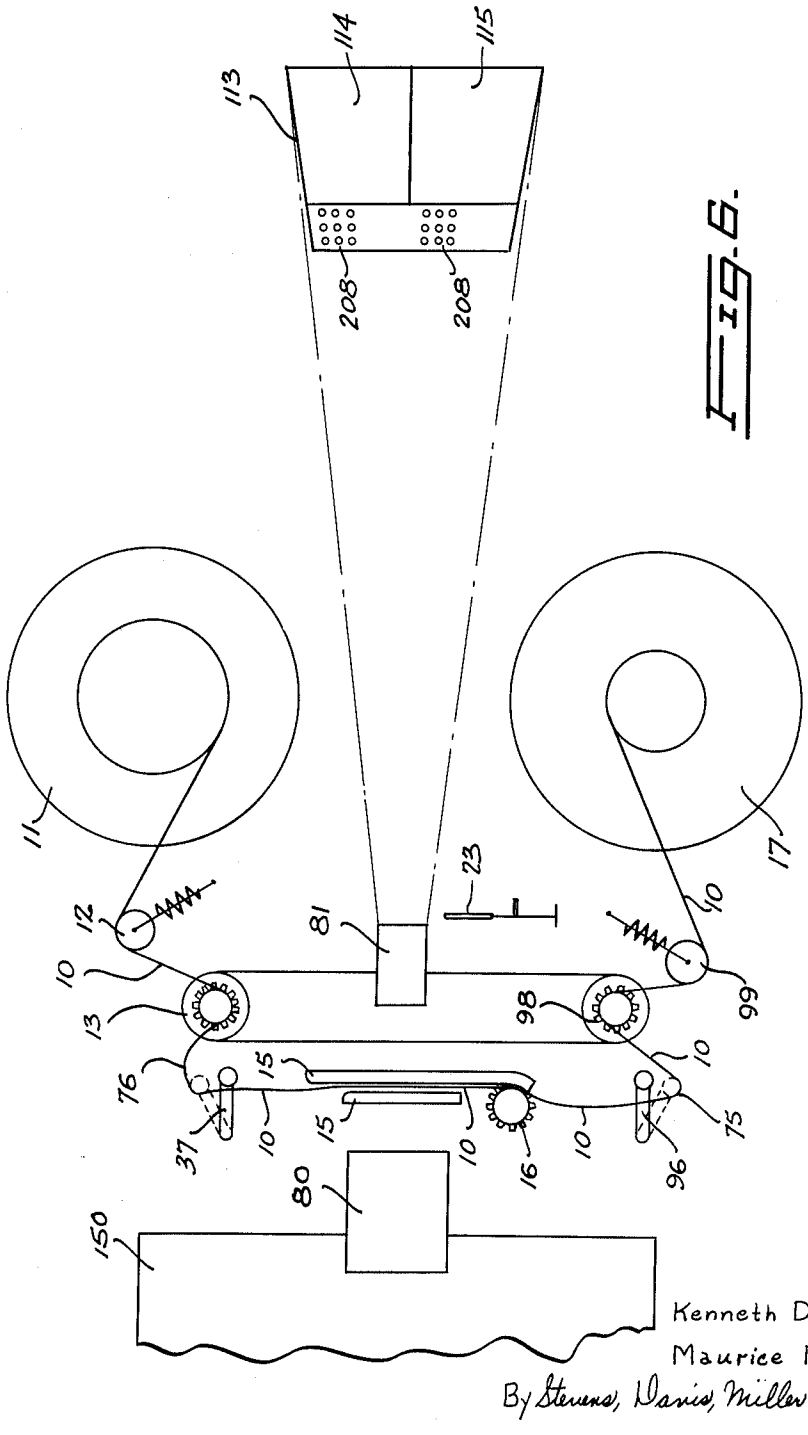

FIG. 6.

Inventors
Kenneth D. J. Grosvenor
Maurice M. Levy
By Stevens, Davis, Miller & Mosher
Attorneys

Nov. 23, 1965 K. D. J. GROSVENOR ETAL 3,218,921

APPARATUS FOR PRESENTING INFORMATION

Filed March 12, 1963 4 Sheets-Sheet 4

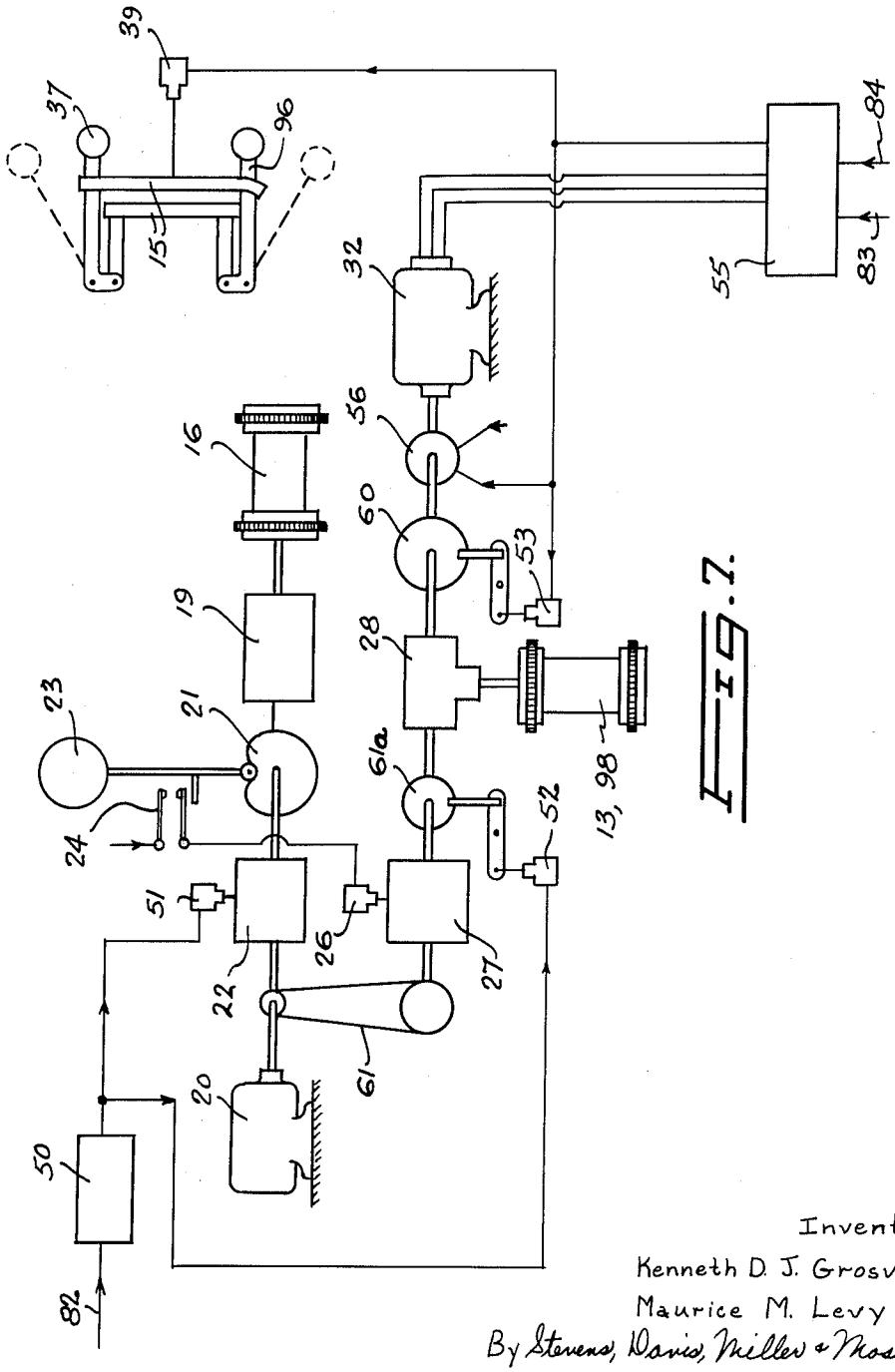

Fig. 7.

Inventors
Kenneth D. J. Grosvenor
Maurice M. Levy
By Stevens, Davis, Miller & Mosher
Attorneys

United States Patent Office 3,218,921 Patented Nov. 23, 1965

3,218,921

APPARATUS FOR PRESENTING INFORMATION

Kenneth D. J. Grosvenor, Ottawa, Ontario, Canada, and Maurice M. Levy, 208 Clemow Ave., Ottawa, Ontario, Canada; said Grosvenor assignor to said Levy

Filed Mar. 12, 1963, Ser. No. 264,488
Claims priority, application Canada, Mar. 13, 1962, 844,232
8 Claims. (Cl. 88—28)

This invention relates primarily to apparatus adapted to simulate the operation of a post office coding machine.

In a post office coding machine, a pair of letters to be coded are displayed before the operator in a pair of windows. He reads one address, determines from his memory the correct code for this address, and then applies this code to a binary type keyboard. While performing this latter operation he switches his attention to the address on the second letter and prepares to code it. When the first coding operation has been completed the first letter is removed and is replaced by a third letter. This change takes place while the operator is directing his attention to the second letter, and the third letter is ready for him when he is ready to direct his attention to it, which he does while coding the address on the second letter which is then promptly replaced by a fourth letter, and so on.

In another type of post office coding machine, the letters are moved simultaneously. When the operator has completed the coding of a letter in one window, that letter disappears and is replaced by the letter previously seen in the second window, this second letter being replaced by a third letter. In this case, the operator can glance at the second letter before completion of the coding operation for the first letter; then, when coding for the first letter is completed, the operator's eyes can follow the second letter from the first window to the second window. The term "coding" is used to refer not only to the application of code markings to a letter itself, but also to the performance of a sorting function which is controlled by signals from the operator's keyboard, such signals then constituting a sorting code.

The object of the invention is to provide apparatus for simulating one or other of these forms of operation for the training of operators.

This object is achieved by apparatus comprising:

(a) A film strip having a plurality of serially arranged frames,

(b) And a projector for displaying said strip, including means for displaying one said frame in its entirety at one time and means for advancing the film to display a second said frame in its entirety at a second time,

(c) Each said frame containing two separate, discrete and different images,

(d) And each frame having one image identical with an image of one adjacent frame and a second image identical with an image of the other adjacent frame.

Machines used for training and testing which operate by projecting an image, which automatically score the student, and which automatically replace a projected image by another image, and thus constantly replace the problem before the student by a new and different problem are known. However, such devices have been found lacking for the training and testing of operators of machines which require manual dexterity on the part of the operator, as none of the above machines is able to present information to the student without introducing a noticeable pause in which the student must become accustomed to the new information projected.

It is desirable to give the student the opportunity to preview the information he must next process during the period that he is processing the current information.

Limitations of the previously known devices are especially felt in the training of operators in the use of manual coding machines, as previously known devices are not able to present information in the manner most advantageous to the operator.

The previously known equipment is not the most suitable for training the operator of a machine which requires speed and dexterity, as these systems deprive the student of the valuable opportunity to preview the information which is next to be processed. At each change of projected information the student must become accustomed to the newly presented information and then decide on the correct series of manual responses required. Thus a series of operations which could normally be done continuously is broken down into a number of disjunctive operations. The particular arrangement of the present invention in which identical images are located on adjacent frames (so that each image is projected twice) and the arrangement whereby two images are always projected simultaneously, provides a solution to this difficulty.

Although the present disclosure has been directed primarily to the simulation of a post office coding operation, it will be apparent that the apparatus is equally applicable to the simulation of other situations where an operator to be trained or tested is required to have two images displayed before him simultaneously and one is to be replaced while the other remains with no apparent interruption.

Other features of the invention are described below.

Referring now to the drawings, one manner of carrying the invention into practice will be explained in detail and by way of example only. The scope of the invention is limited only by the appended claims.

FIGURES 1 to 4 and 2*a* each show portions of film strip.

FIGURE 5 shows a perspective view of projection of such a film strip onto a screen.

FIGURE 6 illustrates the projector and screen arrangement in more detail.

FIGURE 7 shows film advancing mechanism diagrammatically.

FIGURE 8 shows in block form the electronic circuitry for controlling operation of the apparatus.

The film strip **10** shown in FIGURE 1 consists of a series of frames **102**, **103**, **104**, etc. Each frame has two different images: i.e., frame **102** has images **105** and **106**, frame **103** has images **107** and **108**, frame **104** has images **109** and **110**, and so on. These images will be addresses, if the film is to be used for the training of an operator of a code-sorting machine. Reference letters A, B, C, D and N represent specific addresses and it will be observed that each pair of adjacent frames has one image that is the same. Thus image A appears on both frame **102** and **103**; image B on frames **103** and **104** and so on. The film strip **10** also has binary code markings **111** in each frame. These patterns of code markings are projected simultaneously with their corresponding images. The markings consist of three rows of dots (or absence of dots) arranged in 3 columns.

The images may be arranged in other ways as shown in FIGURES 2, 3 and 4, which illustrate film strips **10A**, **10B** and **10C**. Strip **10A** is the same as strip **10** except that the relative positions of the two images are reversed in alternate frames. Thus frames **102** and **104** are the same as before, while frame **103** has its images B and A in reversed position. In FIGURES 3 and 4 the images are arranged side-by-side in frames **102** to **104** on stripe **10B** and **10C**, and again the difference between these two

arrangements is reversal of the images of each alternate frame (compare frames 103 of FIGURES 3 and 4).

FIGURE 5 shows film strip 10 being projected onto a screen 113 by projector 150. When frame 102 is being projected, the image 105 (address A) appears on upper section 114 of the screen, and image 106 (address N) appears on lower section 115 of the screen. When the film is advanced to project frame 103, image 107 (again address A) is seen on section 114, and image 108 (address B) is projected onto section 115. In this manner the viewer has the impression that only the image on section 115 has changed. When the film is advanced one more frame address B is retained in section 115 while address A is changed to address C.

When strip 10A of FIGURE 2 is projected the changing of the projected images is different. When frame 103 is projected onto screen 113, address B appears on upper section 114, and address A appears on lower section 115. When the film is advanced to the next frame 104, a new address C is projected on section 114, while the address B now appears on the lower screen section 115. Thus each address appears to the viewer first on the upper section, then moves down to the lower section, and finally is entirely replaced. The film strips 10B and 10C shown in FIGURES 3 and 4 when projected produce the same effect as strips 10 and 10A, except that the vertical juxtapositioning of the images has been replaced by a horizontal one.

Another method of achieving the effect of strip 10A of FIGURE 2 is to use a film strip on which each image appears only once, and to project two such adjacent images simultaneously. The film would be indexed forward each time by only the width of one image. Such an arrangement is shown in FIGURE 2A. Each frame 102, 103, 104 of strip 10D overlaps its adjacent neighbours on both sides, not being a separate and discrete frame in the manner of FIGURE 2. Nevertheless, for the present purposes, each frame 102, 103, 104 etc. represents and can be considered as one of a plurality of serially arranged and different (if not discrete) frames.

Details of the projector 150 and the screen 113 are shown in FIGURE 6. Film strip 10 is unwound from spool 11, passes over a tension roller 12, and a loop-forming sprocket 13. The film 10 then describes a free loop 76, passes through gate guides 15, and is engaged by a drive sprocket 16. After describing a second free loop 75 formed by a loop-forming sprocket 98, the film 10 continues over a second tension roller 99 to a take-up spool 17. The lamp and lenses 80, 81 of the projector project the images on the film onto the screen 113 in the usual way.

Screen 113 consists of two translucent sections 114, 115 on which addresses are projected for the benefit of a student who is seated in front of the screen, that is facing the screen as it is seen in FIGURE 5. He has a keyboard 201 by which to transfer each address to binary code form. Photo-sensitive elements 208 detect the code markings 111 on the film.

FIGURE 7 illustrates the mechanical arrangement of the projector and the controller. A single speed motor 20 drives to a one turn clutch 22 which when operated by solenoid 51 powers a geneva mechanism 19. The geneva mechanism is directly coupled to the sprocket 16 which drives the film. Since the geneva mechanism has a ¼ turn output for every one turn input, and ¼ turn of the sprocket 16 corresponds to one frame on the film, the film is advanced one frame for every complete revolution of the one turn clutch 22. On the output side of the one turn clutch 22, a cam 21 is located which operates a shutter 23 and a micro-switch 24. The micro-switch 24 controls a solenoid 26 for energising another one turn clutch 27 which drives the loop-forming sprockets 13 and 98 through a differential 28. The input to one turn clutch 27 is driven by the motor 20 through

a belt drive 61. One turn of the clutch 27 acts through the differential 28 to turn the loop-forming sprockets a ¼ turn, which corresponds to one frame advance. During single frame operation a lock 60 prevents any turning of the other shaft of the differential 28.

Thus, when one frame is advanced by the geneva mechanism 19, the loop-forming sprockets 13 and 98 turn through a ¼ turn to add one frame to loop 76 and remove one frame from loop 75. In this way the geneva mechanism 19 is always driving the same mass of film. Spring belt drives (not shown) extend in a conventional manner from each loop-forming sprocket through ratchets and friction clutches to the spools 11 and 17. When a loop-forming sprocket pulls a quantity of film from a spool, it does so against the resistance of a friction clutch. In this way the film is always kept tightly wound on the spools.

Rollers on pivoted arms 37 and 96 engage the film with light spring tension, being positioned between each loop-forming sprocket and the drive sprocket 16 to take up shock during single frame operation. During each single frame advance, the cam 21 makes one revolution, to actuate the shutter 23 so that the light is cut off during the time the film is moving. This time interval may be as low as 10 milliseconds. Single frame advance is controlled by a relay 50 which energises the solenoid 51 and also a solenoid 52 which unlocks a lock 61*a* on the output from clutch 27.

For the purposes of fast forward or reverse operation there is provided a relay 55 which actuates a solenoid 53 to unlock lock 60 and hence the output shaft of a fast forward and reverse motor 32. Relay 55 also energises a solenoid 39 to move the film gate guides 15 to disengage the film from drive sprocket 16. It also extends roller arms 37 and 96 to hold in tension the length of free film between loops 75 and 76. The movements of the film gate guides and the arms are interconnected so that the film does not completely move away from the sprocket 16 until the arms 37 and 96 have spread out enough to have the film 10 under control; similarly when the arms move inwardly, the film gate guides 15 take charge of the film before the arms 37 and 96 allow it to go slack.

A centrifugal switch 56 keeps power on the solenoids 53 and 39 as long as the motor 32 is rotating. Thus, when the circuit for fast forward or reverse is broken by relay 55, and motor 32 begins to slow down, the solenoids are held closed by the centrifugal switch 56 until the motor has stopped or come down to a very low speed.

Three control inputs are provided. One on input line 82 to relay 50 for single frame operation, and two on lines 83 and 84 to relay 55 for fast forward and fast reverse operation respectively.

A block diagram of a control lay-out is shown in FIGURE 8. Signals representing the coded address pass from keyboard 201 along line 220 to storage and comparison circuit 202. Assuming that these signals are to be compared with the code markings 111 on the film frames, the photo-sensitive assembly 208 is used to feed corresponding signals along line 221 into the storage and comparison circuit 202. If preferred this standard of comparison may take other forms, such as a punched or magnetic tape synchronized with the film. When the keys of the keyboard 201 are depressed, information is stored in the elements of the storage and comparison circuit 202 corresponding to the keys depressed. When all the keys are released, indicating that the input of information is completed, or the operator depresses a special key to indicate completion of the operation, a signal passes on line 222 to a pulse generator 203 which generates single gating pulses which are sent in timed sequence to photo-sensitive assembly 208, storage and

comparison circuit **202**, an error detector **204**, and a controller **206** for the purposes now to be described.

The gating pulse in line **223** to the assembly **208** causes it to pass its output signals to the storage and comparison circuit **202**. The gating pulse in line **224** to this circuit **202** causes a comparison to be made between the signals from the assembly **208** and the information held in storage and previously received from the keyboard **201** and for the result of this comparison to be fed along line **225** to the error detector **204**. Upon gating of detector **204** by a pulse in line **226** from generator **203**, any error is passed along line **227** to error indicator **207** which may take the form of a display or a recorder or both. Counters (not shown) may be used to count the total number of frames processed, the frame processing rate, or other information indicating the student's performance.

The fourth gating pulse from generator **203** travels in line **228** to controller **206** which (in normal operation) then advances the film one frame by pulsing line **82** to energise relay **50** (FIGURE 7). The controller **206** can include programming means by which frames may be repeated or skipped under high or low error conditions. Error signals received in line **229** from error detector **204** will be counted over a number of frames. If the errors exceed a given number, the controller will reverse the film over a given number of frames in order that the exercise may be repeated. Similarly, if the errors are lower than a given number, the controller **206** can advance the film to avoid needless practice on an exercise satisfactorily performed. Normally the film strip will begin with the easier exercises and progress to the more difficult ones.

Another mode of operation may be useful in initial training. Any error in detector **204** is passed by line **230** to stop circuit **209** which de-energises pulse generator **203** by line **231** to cause operation of the device to cease and an error light **211** to be lit. To resume operation, the operator must press a reset button **210**, then key in the correct code at keyboard **201**. Mode selection **212** determines whether stop circuit **209** is operative or not.

Push-buttons may be used to operate relay **50** or relay **55** for manual control of the film-changing mechanism.

Alternatively, instead of having the film advance determined by the operator through pulse generator **203**, the controller **206** can be programmed to advance the film automatically by one frame after a fixed time interval. This would test the operator for machines which present new material to the operator at a constant rate.

What we claim is:

1. Apparatus for presenting successive two-image visual displays to an operator for said operator to respond to one said image while previewing the other said image preparatory to responding subsequently to said other image in a next display, said next display presenting to said operator said other image and a new image, said apparatus comprising:

(a) a film strip having a plurality of serially arranged frames,

(b) each said frame containing two separate discrete and different images,

(c) a projector for displaying said strip, said projector including

(i) means for displaying one frame in its entirety at one time with each image of said one frame displayed discretely from the other image of said one frame and adjacent such other image, and

(ii) means responsive to an input signal for advancing said film by one frame upon occurrence of said input signal for displaying a second frame in its entirety at a second time, until receipt of a further input signal,

(d) and each frame having one image identical with an image of one adjacent frame and a second image identical with an image of the other adjacent frame.

2. Apparatus according to claim **1**, wherein

(a) said frames are separate and discrete from each other,

(b) each frame contains two images disposed in a pair of respective locations in the frame, such locations being the same for every frame,

(c) the image in the first location in a first frame being identical with the image in the first location in a second frame adjacent the first frame,

(d) and the image in the second location in the first frame being identical with the image in the second location in a third frame positioned adjacent the first frame on the side thereof opposite the second frame.

3. Apparatus according to claim **1**, wherein

(a) said frames are separate and discrete from each other,

(b) each frame contains two images disposed in a pair of respective locations in the frame, such locations being the same for every frame,

(c) the image in the first location in a first frame being identical with the image in the second location in a second frame adjacent the first frame,

(d) and the image in the second location in the first frame being identical with the image in the first location in a third frame positioned adjacent the first frame on the side thereof opposite the second frame.

4. Apparatus according to claim **1**, wherein said frames overlap each other, each frame sharing an image with each adjacent frame.

5. Apparatus according to claim **1** including means for generating a said input signal at regular time intervals, such time intervals being selected for said operator to complete a said response therein.

6. Apparatus according to claim **1** comprising

(e) a screen associated with said projector for displaying images projected therefrom,

(f) means actuable by said operator during his response to said one image for generating a first signal representing the content of said one image,

(g) code markings on each frame associated with each image and representing the content of each image in coded form,

(h) photosensitive elements, and means mounting said photosensitive elements for energization by the projected image of said code markings to generate a second signal representing the content of said one image,

(i) means coupled to said means (f) and (h) for comparing said first and second signals and for detecting discrepancies therebetween, and

(j) error indicating means coupled to said means (i) for recording the presence of such discrepancies.

7. Apparatus according to claim **1** including

(e) means sensitive to completion of response of said operator to a said image for generating a said input signal upon such completion, thereupon to cause advancement of said film by one frame.

8. Apparatus according to claim **7** wherein said means (e) comprise means manually operable by said operator upon completion of said response to an image.

References Cited by the Examiner

UNITED STATES PATENTS

1,514,543	11/1924	Lane et al.	352—43
2,124,906	7/1938	Bryce.	
2,563,892	8/1951	Waller et al.	352—70
3,026,633	3/1962	Browne	352—39

JULIA E. COINER, *Primary Examiner.*