April 9, 1968 SANAE AMADA 3,377,485

PHOTOMECHANICAL CODE KEYBOARD UNIT

Filed Jan. 27, 1965

FIG. 1

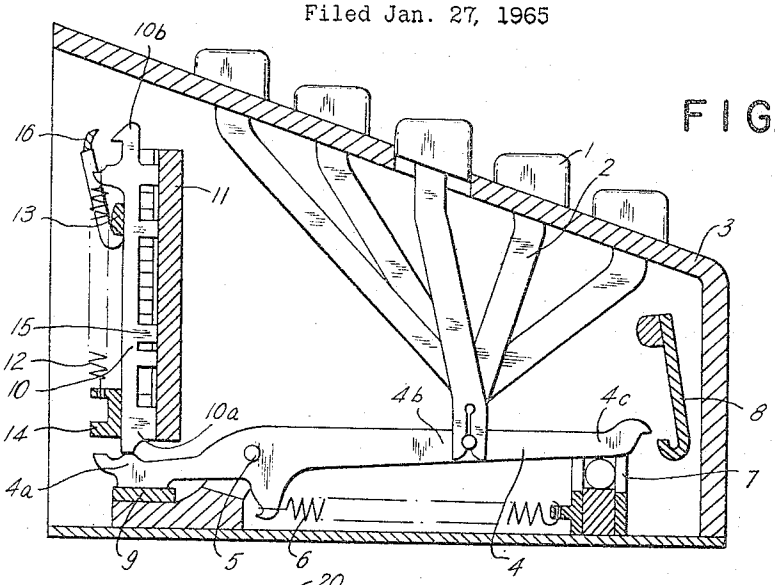


FIG. 2

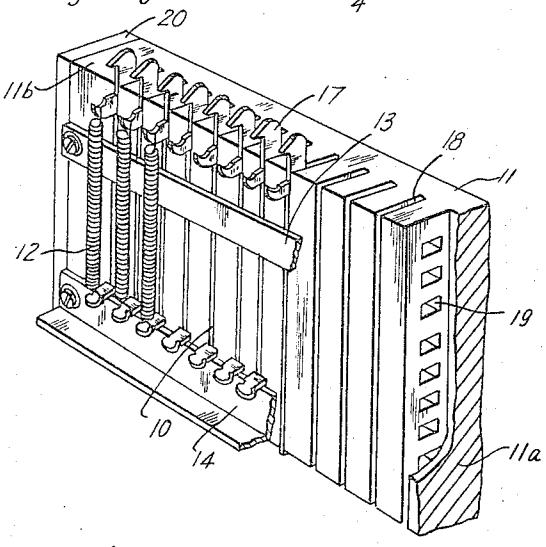


FIG. 3

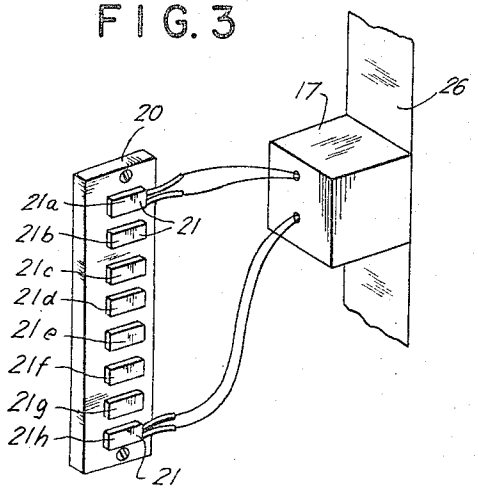
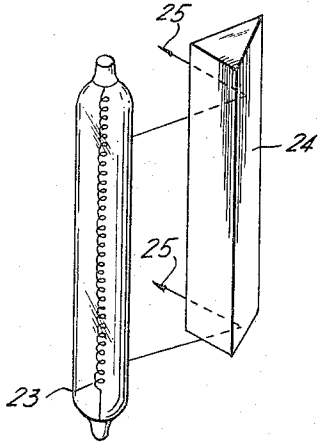


FIG. 4



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PHOTOMECHANICAL CODE KEYBOARD UNIT

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1 Claim. (Cl. 250—229)

ABSTRACT OF THE DISCLOSURE

Code keyboard apparatus comprises a plurality of photoelectric transducers spaced from a source of light to provide a coded output corresponding to a key-selected input. The light is directed to the photoelectric transducers in a plurality of separate light paths, each of the light paths being directed to a corresponding one of the photoelectric transducers. Each of a plurality of spaced separate code bars has a plurality of projections arranged in a pattern determining a corresponding code indication. A guide slidably supports the code bars in positions between the source of light and the photoelectric transducers wherein selected ones of the projections of the code bars are adapted to block corresponding ones of the light paths in determined positions of the code bars thereby providing a coded output. Key actuated members in contact with the code bars selectively move the code bars in the guide to the determined positions in accordance with a key-selected input.

The present invention relates to a photomechanical code keyboard unit. More particularly, the invention relates to a code keyboard unit utilizing combined mechanical and photoelectric apparatus.

Known keyboard units utilize solely mechanical apparatus and rarely or never utilize electromechanical or photoelectric apparatus. Mechanical apparatus in keyboard units is deficient, however, in that the speed of operation is slow and the operation is noisy.

Although photoelectric apparatus is theoretically superior to soely mechanical apparatus, suitable photoelectric apparatus has not been developed prior to the present invention. This is especially true when it comes to controlling the light paths through the apparatus.

The principal object of the present invention is to provide a new and improved code keyboard unit.

An object of the present invention is to provide a new and improved photomechanical code keyboard unit.

Another object of the present invention is to provide a code keyboard unit which has a fast speed of operation and which operates quietly.

In accordance with the present invention, code keyboard apparatus comprises a source of light and a plurality of separate photoelectric transducers spaced from the source of light. A director directs the light to the photo-electric transducer in a plurality of separate parallel spaced light paths, each of the light paths being directed to a corresponding one of the photo-electric transducers. A plurality of spaced separate code bars each has a plurality of projections arranged in a pattern determining a corresponding code indication. A guide slidably supports the code bars in parallel spaced positions relative to each other between the source of light and the photoelectric transducers wherein selected ones of the projections of the code bars are adapted to block corresponding ones of the light paths in determined positions of the code bars. Key actuated apparatus in contact with the code bars selectively moves the code bars in the guide means to the determined positions. The key actuated apparatus comprises a plurality of keys, a plurality of key levers each affixed to a corresponding one of the keys and a

plurality of control levers each being pivotally mounted with one end in contact with a corresponding one of the code bars and with another portion coupled to a corresponding one of the key levers.

In order that the present invention may be readily carried into effect, it will now be described with reference to the accompanying drawings, wherein:

FIG. 1 is a side view, partly in section, of an embodiment of a code keyboard unit of the present invention;

FIG. 2 is a perspective view, partly cut away, of a part of the embodiment of FIG. 1;

FIG. 3 is a perspective view of another part of the embodiment of FIG. 1; and

FIG. 4 is a perspective view of still another part of the embodiment of FIG. 1.

In the figures, the same components are identified by the same reference numerals.

In FIGS. 1 and 2, the code keyboard unit includes a plurality of keys **1** each corresponding to a specific information such as, for example, a letter of the alphabet, a number or a punctuation mark. A plurality of key levers **2** each is affixed to a corresponding one of the keys **1**.

Each of a plurality of control levers **4** is pivotally mounted on a pivot pin **5**. Each of the control levers **4** has one end **4***a* and another portion **4***b*. Each of the control levers **4** is coupled to a corresponding one of the key levers **2** at its portion **4***b*.

The control levers **4**, of which one is shown in the drawings, are shown in their inoperative or rest position in the drawings (FIG. 1). When a key **1** is depressed by the operator, the corresponding key lever **2** moves the corresponding control lever **4** in a clockwise direction around the pivot pin **5**.

The apparatus of the code keyboard unit is mounted in any suitable manner in a suitable housing **3**. Each of the control levers **4** may be urged in a counterclockwise direction about the pivot pin **5** by a spring **6** which thus returns said control lever to its rest position. Each spring **6** is affixed at one end to the housing or a fixed part of the apparatus and at its other end to the corresponding control lever.

Each of the control levers **4** may be provided with a locking device **7** at an end **4***c* of said control lever which limits the clockwise movement of the control lever and a stop **9** may be provided at the end **4***a* of each control lever to limit its counterclockwise movement. The devices **7** and **9** are affixed to the inside of the housing **3** or to suitable fixed parts of the apparatus. Furthermore, a lock lever **8** may be provided to lock each control lever in its rest position.

A guide block **11** is provided. A source of light is positioned at one end **11***a* of the guide block **11** and may comprise the light source of FIG. 4, wherein an elongated lamp **23** is positioned in spaced parallel relation with an optical rectangular prism **24** of suitable type. The light produced by the lamp **23** is directed into a substantially planar beam of light **25** by the prism **24**. The plane of the beam of light extends between and is defined by the light rays **25**.

A plurality of separate photo-electric transducers **21** are positioned at the opposite end **11***b* of the guide block **11** and may be mounted on a board **20** as shown in FIG. 3, for example. Each of the photo-electric transducers **21** may comprise any suitable device for converting light energy into electrical energy such as, for example, a photo transistor. The photo-electric transducers **21** include transducers **21***a*, **21***b*, **21***c*, **21***d*, **21***e*, **21***f*, **21***g* and **21***h*.

A plurality of channels or conduits **19** are formed through the guide block **11** extending in spaced parallel relation to each other from the end **11***a* to the end **11***b* of said guide block. The conduits **19** direct the light from

the light source to the photo-electric transducers **21** in a plurality of separate parallel spaced light paths, each of the light paths being directed to a corresponding one of the photo-electric transducers. Thus, without intermediate obstruction, each photo-electric transducer **21** is energized by or irradiated by a corresponding beam of light separate from and uninfluenced by the other beams of light from the light source.

A plurality of parallel spaced slots or grooves **18** are formed in the guide block **11**. The guide block **11** is supported in any suitable manner by the housing **3** or apparatus and is preferably maintained in vertical position with the slots or grooves **18** extending vertically. The conduits **19** formed through the guide block **11** and the slots **18** formed in said guide block are perpendicular to each other with each of said conduits being intersected by all of said slots and with each of said slots being intersected by all of said conduits.

A plurality of spaced separate code bars **10** are slidably supported in the slots **18** of the guide block **11**. Each of the code bars **10** is slidably supported for movement in the longitudinal direction of the slots **18** in a corresponding one of said slots. Each of the code bars **10** has a plurality of projections **15** arranged in a pattern determining a corresponding code indication and selected ones or all of said projections of each of said code bars are adapted to block corresponding ones of the conduits **19**.

Each of the control levers **4** abuts the lower end **10***a* of a corresponding one of the code bars **10** so that clockwise movement of a control lever **4** about its pivot pin **5** moves the corresponding code bar **10** in its slot **18** to a determined position wherein the projections **15** of said code bar block corresponding ones of the conduits **19**. The number of conduits **19** is preferably equal to the number of places in the code utilized or to a number large enough to accommodate a number of codes.

A first retaining member **13** is affixed to the guide block **11** across the slots **18** to retain the code bars **10** in their corresponding slots. A second retaining member **14**, spaced from the first retaining member **13**, is affixed to the guide block **11** across the slots **18** to cooperate with the first retaining member in retaining the code bars **10** in their corresponding slots. The first and second retaining members **13** and **14** may be positioned parallel to the conduits **19**.

Each of the code bars **10** may be urged downward by a return spring **12**, which operates similarly to the spring **6**, to return the code bars to their rest position. Each return spring **12** is affixed at one end to the second retaining member **14** and at its other end to the corresponding code bar.

Each of the code bars **10** may be provided with a locking device **16** at an end **10***b* of said code bar which cooperates with the overhang formed in the end **10***b* of the code bar to maintain the code bar in its determined operative position. The devices **16** are affixed to the inside of the housing **3** or to suitable fixed parts of the apparatus.

The code keyboard unit of the present invention operates to convert data or information indicated in the manner of typing, by depressing selected ones of the keys **1**, into a corresponding code. The corresponding code may be recorded as magnetic signals on a suitable magnetizable medium such as, for example, tape, or as perforations in a suitable medium such as, for example, paper tape.

In its rest condition, the code keyboard unit produces no output code information. The keys **1** are in their rest or raised position, the control levers **4** are stationary and the code bars **10** are at rest on their corresponding control levers. The conduits **19** direct a plurality, eight in the illustrated example, of independent light beams to the independent photo-electric transducers **21** unobstructed by the projections **15** of any of the code bars **10**. The photo-electric transducers **21** thus provide electrical signals to suitable recording equipment **17** (FIG. 3) which then records a "no information" signal on a suitable recording medium **26**.

When the code keyboard unit is operated, it produces a code indication of information impressed upon the keys **1**. When a selected key **1** is depressed by the operator, the corresponding key lever **2** urges the corresponding control lever **4** downward at its portion **4***b* so that the control lever moves about its pivot pin **5** in a clockwise direction and its end **4***a* moves upward. The upward movement of the end **4***a* of the control lever **4** moves the corresponding code bar **10** resting thereon upward to its determined or operative position. In the operative position of the code bar **10**, the projections **15** thereof block the corresponding light beams by blocking their conduits **19**. This produces a pattern on the photo-electric transducers **21** which corresponds to the projections **15** of the code bar **10** and the appropriate transducers provide electrical signals to the recording equipment **17** (FIG. 3) which records the appropriate information signal on the recording medium **26**.

Thus, for example, if a key **1** marked "A" is depressed by the operator, the corresponding code bar **10** may have, for example, a pattern of but a single projection **15** which obstructs only a transducer **21***a* (FIG. 3). If a key **1** marked "B" is depressed by the operator, the corresponding code bar **10** may have, for example, a pattern of two projections **15** which obstruct only a transducer **21***b* (FIG. 3). If a key **1** marked "R" is depressed by the operator, the corresponding code bar **10** may have, for example, a pattern of six projections **15** which obstruct the transducers **21***b* (FIG. 3). If a key marked "R" is depressed by the operator, the corresponding code bar **10** may have, for example, a pattern of six projections **15** which obstruct the transducers **21***a*, **21***b*, **21***c*, **21***e*, **21***f* and **21***h* (FIG. 3).

The photomechanical code keyboard unit of the present invention is thus simple in structure, has a fast speed of operation and operates quietly in an efficient, effective and reliable manner. This is due to the fact that the structure of the code keyboard unit has few mechanical components which may slow down the speed of operation or may be noisy in operation. Furthermore, the conduction of the light beams through the conduits **19** completely within the guide block **11** prevents outside light interference or interference between the light paths so that the efficiency, effectiveness and reliability of the code keyboard unit is maintained at a high level.

While the invention has been described by means of specific examples and is a specific embodiment, I do not wish to be limited thereto, for obvious modifications will occur to those skilled in the art without departing from the spirit and scope of the invention.

I claim:

1. Code keyboard apparatus for providing a coded output corresponding to a key-selected input, said apparatus comprising

a source of light;

a plurality of separate photo-electric transducers spaced from said source of light;

directing means for directing said light to said photo-electric transducers in a plurality of separate parallel spaced light paths, each of said light paths being directed to a corresponding one of said photo-electric transducers;

a plurality of spaced separate code bars, each of said code bars having a plurality of projections arranged in a pattern determining a corresponding code indication, each of said code bars having a lower end and an upper end with an overhang formed therein;

guide means having a plurality of spaced parallel vertical slots formed therein for slidably supporting said code bars substantially vertically in said slots in parallel spaced positions relative to each other between

said source of light and said photo-electric transducers wherein selected ones of the projections of said code bars are adapted to block corresponding ones of said light paths in determined positions of the said code bars thereby providing a coded output;

key actuated means in contact with the lower ends of said code bars for selectively moving said code bars upward in said guide means to said determined positions in accordance with a key-selected input, said key actuated means comprising a plurality of keys, a plurality of key levers each affixed to a corresponding one of said keys and a plurality of control levers each being pivotally mounted with one end abutting the lower end of a corresponding one of said code bars and with another portion coupled to a corresponding one of said key levers;

locking means in operative proximity with the overhang formed in the upper end of each of said code

bars for maintaining each of said code bars in its determined position;

retaining means mounted on said guide means for retaining said code bars in the slots of said guide means; and

a pluralilty of springs each affixed at one end to said guide means and at the other end to the upper end of a corresponding one of said code bars for urging said code bars downward in said guide means.

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