United States Patent

Perotto

[15] **3,707,715**

[45] **Dec. 26, 1972**

[54] **DATA INPUT DEVICE**

[72] Inventor: **Pier Giorgio Perotto**, Torino, Italy

[73] Assignee: **Ing. C. Olivetti & C.,S.p.A.**, Ivria(Torino), Italy

[22] Filed: **Jan. 19, 1971**

[21] Appl. No.: **107,718**

[30] **Foreign Application Priority Data**

Jan. 21, 1970 Italy.....67158 A/70

[52] **U.S. Cl.**.....**340/365 P**, 178/17 C, 178/17 D, 178/18, 235/151, 250/217 CR, 340/324 AD

[51] **Int. Cl.**.....**G08b 5/36**

[58] **Field of Search**.....340/337, 365 P, 165, 365 L, 340/324 AD; 250/217 CR; 178/17 A, 17 C, 17 D, 18; 235/151

[56] **References Cited**

UNITED STATES PATENTS

3,441,722	4/1969	Gloess	235/151
3,114,283	12/1963	Gruner	250/217 CR X
3,482,241	12/1969	Johnson	340/337
3,581,003	5/1971	Leone et al.	178/17 D

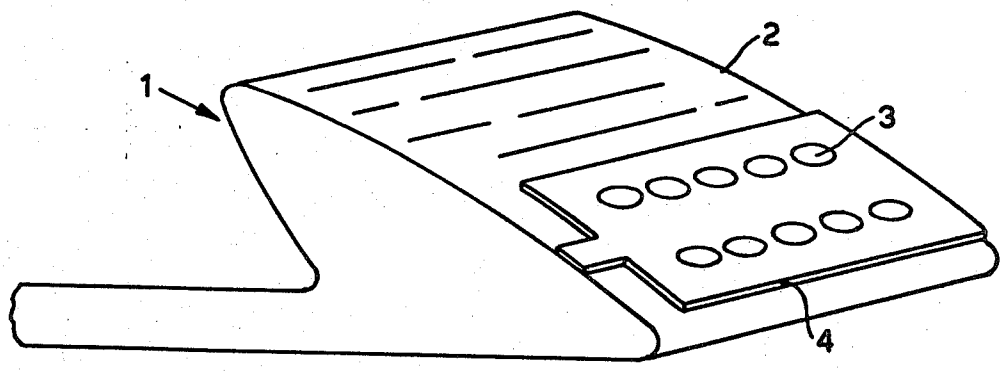
Primary Examiner—David L. Trafton

Attorney—Birch, Swindler, McKie & Beckett

[57] **ABSTRACT**

A data input device comprises a single cathode ray tube whose screen is divided into a plurality of zones. Each zone is scanned with a pattern characteristic of a corresponding code by means of a code matrix. Each pattern excites a zone of the screen to display a corresponding alphanumeric or other symbol with an intensity sufficient to excite a photodetector, which provides an output signal indicative of the code corresponding to a zone when this zone is at least partially obscurated, for increasing the luminous intensity of the character on the screen.

10 Claims, 7 Drawing Figures



PATENTED DEC 26 1972

3,707,715

SHEET 1 OF 2

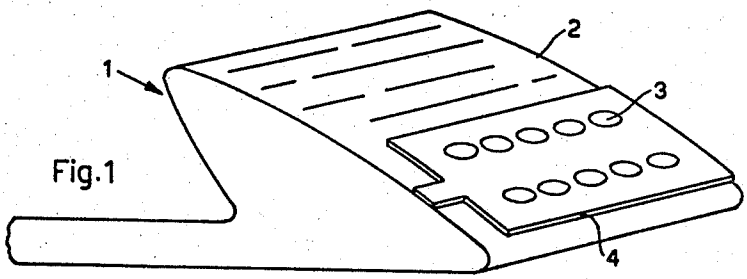


Fig.1

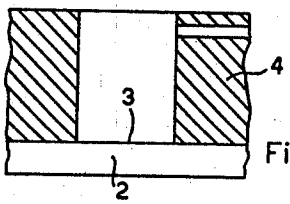


Fig.2

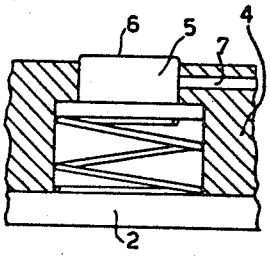


Fig. 3

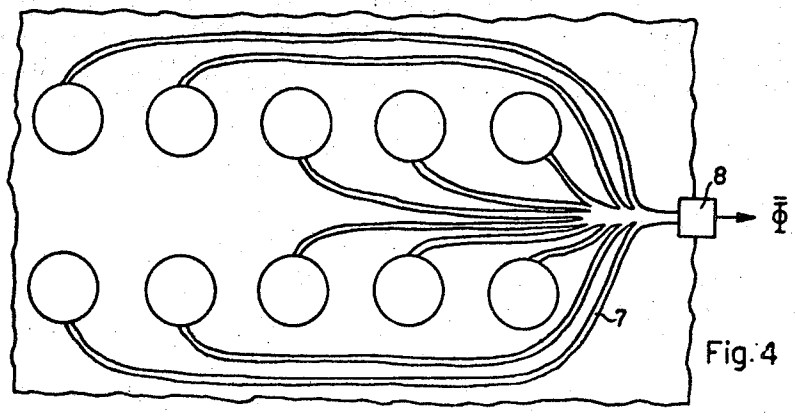


Fig.4

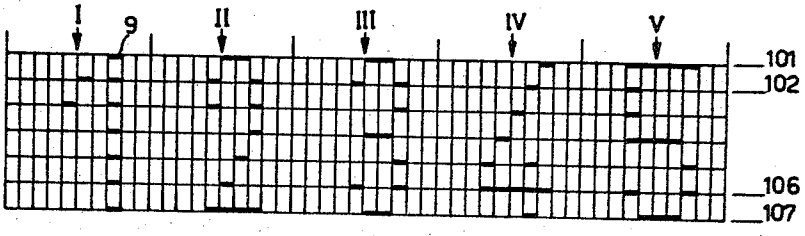


Fig.5

INVENTOR
PIER GIORGIO PEROTTO

BY BIRCH, SWINDLER, MCKIE & BECKETT
ATTORNEYS

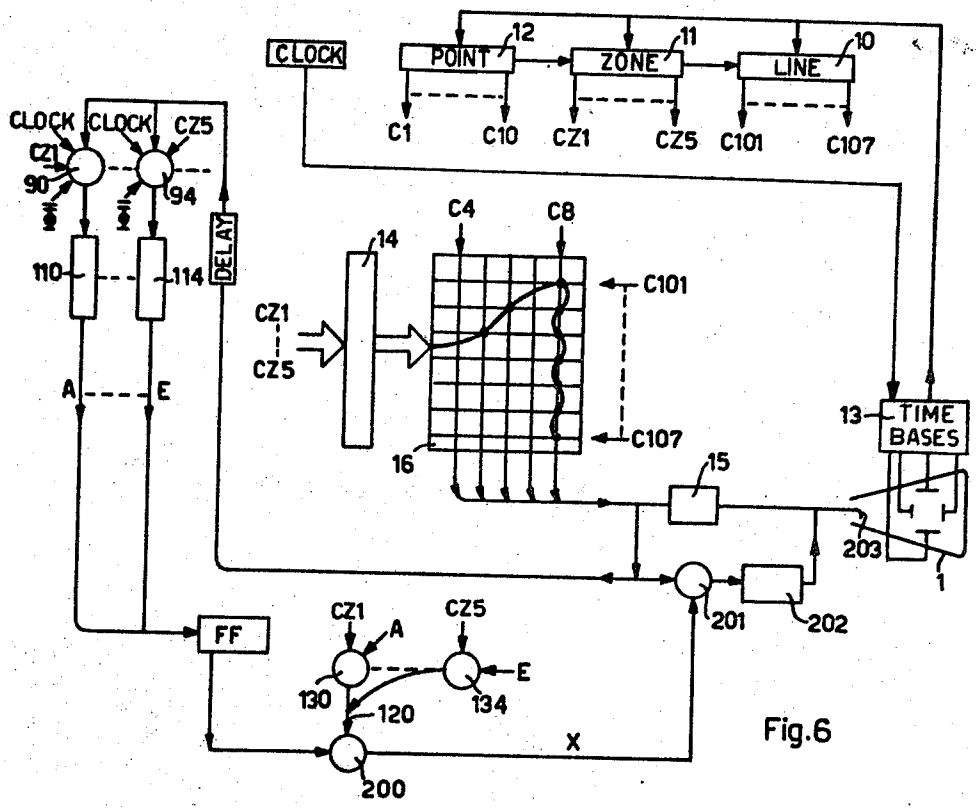


Fig.6

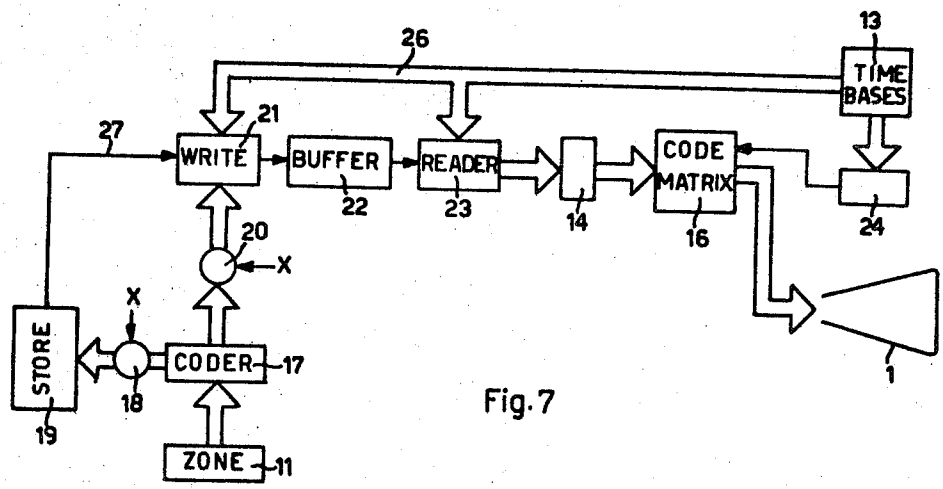


Fig.7

INVENTOR
PIER GIORGIO PEROTTO

DATA INPUT DEVICE

BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention relates to a data input device for example for terminal units of data transmission, comprising a cathode ray tube for displaying on the screen the characters set up by the operator.

2. Description of the Prior Art

Known data input devices are of mechanical construction and therefore they are limited in flexibility and speed by the same technology.

Other known data input devices are costly and complicated, whereby they are rather expensive.

It is also known another data input device, which is provided with a cathode ray tube display controlled by a mechanical keyboard.

SUMMARY OF THE INVENTION

The object of the present invention is to ensure a data input device of electronic construction, which is inexpensive and very simple to manufacture.

According to the invention, there is provided a data input device comprising a single cathode ray tube whose screen is divided into a plurality of zones, first means for scanning each zone with a pattern characteristic of a corresponding code, and second means so responsive to light emanating from the zones as to provide an output signal indicative of the code corresponding to a zone when that zone is at least partially obscured.

The cathode ray tube in the device according to the invention can have its screen divided into a first part for the display of symbols and a second part comprising the said zones. Data entered by means of the second part of the screen can be displayed on the first part.

The invention will be described in more detail, by way of example, with reference to the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a diagram of a data input device embodying the invention;

FIG. 2 shows a first example of a section of the screen at an input zone;

FIG. 3 shows a second example of a section of the screen at an input zone;

FIG. 4 is a diagrammatic view of the input zones;

FIG. 5 is a diagram of the scanning pattern for some of the zones of the input device;

FIG. 6 is a block diagram of the data input device.

FIG. 7 is a general block diagram of the input, processing and visual display arrangement.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

Referring to FIG. 1, a cathode ray tube 1 has a screen 2 divided into two parts. The upper part is adapted to provide a visual display of a message; the lower part is adapted to act as a data input device, which, in this example is a keyboard. The part adapted to represent the keyboard is obtained by forming apertures 3, in correspondence with each key, in a layer of material 4 placed over the lower part of the screen, as is shown in FIGS. 1 and 2. The aforesaid apertures may be free or

open, that is they may show the screen directly (FIG. 2), or into each of them there may be inserted a key 5 having its upper part 6 made of transparent material so that the underlying screen may be visible, as is shown diagrammatically in FIG. 3.

From each aperture 3 there starts an optical fiber 7 (embedded in the material 4 covering the part of the screen intended for the keyboard) leading to a photodetector 8 (FIG. 4).

The electron beam of the tube scans one line of the screen 2 after the other in succession. In correspondence with each aperture the electron beam is modulated in such manner as to produce on the screen an alphanumeric symbol characteristic of the zone in which the symbol is generated. More particularly, each line of the screen is divided into so many "points" 9 the combination of which forms spatially, as has already been said, a character in correspondence with each aperture.

Let us assume that each line in correspondence with each aperture or zone is divided into 10 "points" and the complete zone is formed by seven lines (FIG. 5). Also suppose, as is shown in FIG. 5, that the zones corresponding to the keys are adjacent, (though this need not be the case).

Three counters operate in synchronism with the scanning of the screen by the electron beam, these being a line counter 10, a zone counter 11 and a counter 12 for points inside a zone (FIG. 6). The electron beam begins to sweep the second part of the screen, that is the part which functions as a keyboard. The deflection control unit 13 of the cathode ray tube starts the counters, which therefore count in synchronism with the scanning of the second part of the screen by the electron beam. At the beginning of the scan, the zone counter initiates the count, that is it counts 1 as long as the beam remains in the first zone. The front of the signal CZ1 supplied by the counter 11 on the count of the first zone commands a character generator which, in this particular example, is formed by a 5×7 core matrix 16.

The matrix is controlled by a control unit 14 from which there emerge as many leads as there are characters for the zones of the keyboard. The wires are so linked with the cores of the matrix 16, so that, when the command arrives from the zone counter the unit 14 activates a certain programmed character wire, whereby all and only those cores which give spatially the form of the character itself are put into the 1 state.

It is assumed that the character "1" is assigned to the first zone, so that with the rise of the signal CZ1 of the zone counter 11 there are energized in the matrix those cores which form spatially the character 1. The core matrix moreover has another two inputs. The rows of the matrix are energized by the line counter 10. If the first one hundred scan lines of the screen are used for the visual display of the message, the command C101, that is the command supplied by the counter on the count of the 101st line (first line of the second part of the screen), energizes the first row of the matrix, and so on in succession with the commands C102–2–4–5–6 up to the command C107, which enables the seventh row of the matrix.

When the scanning beam is on the line 101, the first row of the matrix is energized. During the interval of

the first zone, the times from 4 to 8 corresponding to the count from 4 to 8 of the points which is supplied by the point counter **12** in a zone energize the five columns of the matrix in succession. The previously set cores are now reset in succession each core being reset when there are coincident currents in the row and column intersecting at the core. The outputs of the five columns of the matrix are fed as OR function to a unit **15** which controls the grid of the cathode ray tube and hence the intensity of the beam. In this way, a point which corresponds to the sole point of the character "1" in the first line will appear illuminated with a certain intensity in the first zone. As the electron beam continues to scan the lines **101** to **107**, the characters corresponding to the respective zones and determined by suitable prewiring of the core matrix **16** will appear. At the end of the scanning process, the characters will be visible with a reduced luminous intensity in the apertures corresponding to the keys and to the aforesaid zones. The phosphor of the screen, when bombarded by the electron beam, emits by fluorescence and phosphorescence the latter giving rise to persistence. Assume that the photodector **8** is selective as to frequency and reacts to the fluorescence only and assume, moreover, that the fluorescence at a point is substantially instantaneous, the curves of two adjacent points being non-superimposed. As the electron beam scans the lines of the screen, it excites or not given points (unitary segments), as a result of which the light waves are conveyed by the optical fiber corresponding to the zone of which the point contributing to the formation of the character forms part, to the photodetector, which gives an output signal every time a point is excited with a given intensity. If a finger is introduced into a given aperture, or if a key is pushed into the aperture, the optical fiber which starts from this aperture no longer receives the instantaneous light waves produced by the excitation of the points which form the characters and the photodetector no longer gives a signal.

As the scanning of the zones continues, the inverter signal $\overline{\Phi}$ from the photodetector enters a group of AND gates **90**, **91**, **92**, **93**, **94**, etc. equal in number to the number of zones or keys. Each AND gate has as inputs the clock signal, an output signal from the zone counter **11** which identifies the zone, the inverted output $\overline{\Phi}$ of the photodetector and the output (after a delay consistent with the response time of the photodetector) of the core matrix. In this way, an AND gate gives an output when a point which forms the character in the corresponding zone is covered, that is the light information is not received by the photodetector. The AND gates **90**, **91**, **92**, **93**, **94**, etc. are respectively connected to counters **110**,**111**, **112**, **113**, **114**, etc., which have the function of counting the points of the character in the respective zone which are covered. Each counter is required to count not all the points which form the corresponding character, but some, therefore giving a majority decision. Assume that a finger is placed in the first zone on the left at the top and the character "1" is defined in this zone by utilizing nine points of the 5 × 7 matrix. If the finger is placed effectively over all the nine points of the character, there will be nine outputs from the AND gate **90** and, therefore, nine count pulses to the first counter **110**. The counter can however be set to confirm a "1" if it has counted a lower number, for example seven. It is then sufficient for the finger to cover any seven points of the character "1" in the first zone in order that the counter may give the information that the character "1" has been entered. Each counter can count in dependence upon the type of character associated therewith.

The outputs A to E of the counters **110** to **114** control a flip-flop FF. When a counter has completed its count, that is when a finger has covered a given number of points of the character is a zone, a signal is generated which sets the flip-flop FF. The output of the flip-flop FF enables an AND gate **200**. The AND gate **200** has as input a signal **120**, which is the logical sum of the signals issuing from AND gates **130**, **131**, **132**, **133**, **134**, of which there are as many as there are zones in the keyboard. The AND gate **130** is supplied with the signal A leaving the counter **110** and the signal CZ1 which is present throughout the time during which the electron beam is in the first zone of the keyboard. The AND gate **131** is supplied with the signal B and the signal CZ2, and so on.

The output from the AND gate **200** is a signal X present only for the zone period corresponding to the key pressed, which causes the outputs from the core matrix **16** to feed, via an AND gate **201**, a unit **202** which controls the grid **203** of the cathode ray tube **1** in such manner as to generate an electron beam of greater intensity. In this way, the finger having been removed from the aperture in the screen, the underlying character can be seen with a stronger luminous intensity, supplying the operator with the information that the character has been entered.

The screen of the cathode ray tube has the first part **2** at the top adapted to give a visual display of a message. The message to be visually displayed may be generated by the keyboard-operated entering process carried out character by character or may be retrieved, by the keyboard entering of a code, from a store present in a logic unit of the device. Referring to FIG. **7**, the zone counter **11** feeds an encoding unit **17** which can generate a code for each zone. The codes generated by the unit **17** are of two types; to the first type there belong codes corresponding to characters and symbols adapted to be visually displayed and to the second type there belong address codes of locations of a main store **19** in which messages are contained. Consequently, when a key corresponding to an address code is operated on the keyboard, an AND gate **18** is enabled by the signal X in such manner that in the main store **19** there is addressed and read a certain location containing a given message, which is transferred over the line **27** to a writing unit **21**.

The unit **21** writes the codes coming from the wire **27** into a buffer store **22**, in particular of the delay line type, which is adapted to contain an entire block of characters equal to the entire capacity of the first part of the visual display screen of the tube **1**.

When, on the other hand, a key corresponding to a character or symbol which is to be visually displayed directly is operated on the keyboard, the unit **17** feeds an AND gate **20** enabled by the signal X, transferring the code representing the aforesaid character or symbol, which is written into the store **22** by the writing unit **21**.

The store **22** is read by the unit **23**. Both the unit **21** and the unit **23** receive from the channel **26** timing signals coming from the time base unit **13** controlling the deflection of the cathode ray of the tube **1**. The characters issue from the store **22** in synchronism with the sweeping of the first part of the screen by the electron beam.

The codes leaving the unit **23** feed the control unit **14** of a character generator, which is the 5 × 7 core matrix **16** already described. The core matrix is read by a count unit **24** which, in particular, may be represented by the same counters **10, 11, 12**, which are suitably adapted.

The embodiment of the invention hereinbefore described provides for many variants. The main store **19** shown in FIG. **7** may be an integral part of a central processor to which the input-output device is connected through the medium of a transmission control unit. Also inherent in the invention is the complete modifiability of the keyboard by mere replacement of the plate indicated by the reference **4** in FIG. **1** by another plate having an arrangement of the keys which differs in accordance with the most diverse requirements. The modifiability can moreover be given effect at character generation level, as a result of which it is possible to obtain visual display of the most diverse types of symbols. Instead of generating characters with a core matrix, this may be effected with the use of a part of a store (for example a read only store) for this function and the decision as to which type of characters are to be visually displayed will be a programming task. Moreover for conducting the light from the key zones to the photodetector, it is possible to employ, in the place of optical fibers, a uniform layer of transparent and photoconductive material placed over the screen; this layer of material enables all the information of presence or absence of light on the screen to be transferred as it appears at the scanning rate given by the electron beam.

I claim

1. A data input device for posting characters comprising a cathode ray tube having a screen divided in a plurality of zones, and screen scanning means for scanning said zones to cause the display of a character corresponding to the scanned zone in the same zone, wherein the improvement comprises:

a photodetector for detecting the light generated by said zones,

a plurality of light conveying means for conveying the light generated by said zones to said photodetector, and

a plurality of decoders each one associated with a corresponding one of said zones and jointly activated by said photodetector and said scanning means to generate code signals corresponding to a zone of said plurality of zones which is at least partially obscured.

2. A data input device according to claim **1**, including a layer of material disposed over at least a portion of said screen and having apertures over each one of said zones, wherein said light conveying means comprise a light guide extending from each of said zones to the photodetector.

3. A data input device according to claim **2**, comprising further means responsive to said code signals to increase the intensity with which the electron beam of the cathode ray tube scans the corresponding zone, thereby to illuminate the corresponding symbol of said zone with greater intensity and confirm input of the character corresponding to said zone.

4. A data input device according to claim **2** wherein said light guides pass through said layer of material to said photodetector.

5. A data input device according to claim **4**, wherein each of said apertures is dimensioned to receive a finger or other body for obscuring the zone corresponding to said aperture.

6. A data input device according to claim **1**, wherein the screen of the cathode ray tube is divided into a first part for the display of symbols and a second part comprising said zones, said device comprising means responsive to at least one of said code signals to display a message corresponding to said code signals on the first part of the screen.

7. A data input device according to claim **6**, wherein said display means comprise a buffer store for storing in succession the code signals provided by said plurality of decoders as the second part of the screen is scanned, and a symbol generator coupled to said buffer store and responsive to the code signals stored therein during scanning of the first part of said screen by said scanning means for displaying a message made up of symbols corresponding to the codes of the code signals on the first part of the screen.

8. A data input device comprising:

a cathode ray tube having a screen divided into a plurality of zones, each of said zones being associated with a corresponding character and individually conditionable for posting said corresponding character,

displaying means for displaying said characters by exciting the zones of the screen according to the corresponding characters, and

display control means responsive to the conditioned zone for causing said displaying means to incrementally excite the conditioned zone, whereby the posted character is displayed by an incrementally increased light.

9. A data input device according to claim **8**, wherein said displaying means comprise an electron beam generator and said display control means comprise decoding means for decoding the zone of the screen to be incrementally excited, and circuit means activated by said decoding means for causing said electron beam generator to generate an electron beam of greater intensity in correspondence with said decoded zone.

10. A data input device according to claim **9**, wherein said decoding means comprise a photodetector responsive to the light generated by each zone and generating a signal when a zone is at least partially obscured, scanning means for cyclically scanning said zones, and gate means associated with each of said plurality of zones and responsive to said scanning means and to the signal generated by said photodetector to activate said circuit means.

* * * * *