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(54) A SYSTEM FOR ENCODING THE MEMBERS
 OF A WORKING STOCK OF CHINESE OR OTHER
 IDEOGRAPHIC CHARACTERS

(71) We, CABLE AND WIRE-
 LESS LIMITED, a British Company of
 Mercury House, Theobalds Road, London
 WC1X 8RX do hereby declare the
 invention, for which we pray that a Patent
 may be granted to us, and the method by
 which it is to be performed, to be
 particularly described in and by the
 following statement:—

This invention relates to a system for
 encoding the members of a working stock
 of Chinese or other ideographic characters.

The machine handling of Western
 languages, by such apparatus as telegram
 systems, phototypesetting machinery and
 computers is a long-established technique,
 facilitated by the alphabetic nature of the
 scripts, which enables electrical or
 mechanical coding of a relatively small
 number of items to achieve a vocabulary of
 unlimited extent. The development of
 effective machine handling of morphemic
 linguistic scripts such as Chinese has,
 however, been a relatively slower process,
 since their non-alphabetic nature demands
 either a very large number of individually
 coded items, of the order of 10^4 , or
 alternatively a geometrically based
 synthesis of each individual symbol from a
 standard stock of coded components.

The basic method of using individual
 code items is represented for the case of
 Chinese characters by the Chinese
 Telegraphic Code (now revised as the
 Standard Telegraphic Code). This is an
 agreed system whereby Chinese characters
 are allocated individual codings, so that a
 message may be encoded by means of a
 code book and de-coded by reference to an
 identical book. Some 10,000 characters are
 included, and apart from the slow speed of
 such a manual process, there is found to be
 a high human error rate in transcription to
 and from S.T.C. (Standard Telegraphic
 Code). Attempts have been made to use

manual lookup tables in conjunction with
 complex electro-mechanical keyboards,
 but this still involves cumbersome keyboard
 arrangements highly subject to mechanical
 failure and operator error.

The synthetic method has been
 considered as a possible means of enabling
 print-out of synthesised characters to be
 achieved, and experiments have been
 reported in which a standard western
 typewriter keyboard layout has been used
 to input graphic components and
 composing instructions, but the outputs are
 so highly stylised that they are barely
 acceptable. A further disadvantage of this
 approach lies in the number of discrete
 operations necessary to synthesise any
 characters other than the geometrically
 simplest cases. It is also probable that
 operator error will be high.

It has also been attempted to speed up
 the methods employing look-up tables by
 calling up groups of characters onto a
 cathode ray display, and using a light pen to
 identify the given character, but the rate of
 operation of such a method is still relatively
 slow. Further, the resolution of the display
 limits the number of characters which can
 be displayed at any time, resulting in the
 need for large numbers of frames, and
 corresponding slowness in searching.

According to the present invention, a
 system for encoding the members of a
 working stock (as hereinafter defined in
 relation to Chinese characters) of Chinese
 or other ideographic characters, comprises
 in combination a co-ordinate position
 sensing device having

- a) a working surface divided into an array
 of discriminable cells,
- b) an array containing the characters of
 the stock, this array being juxtaposed
 in register with at least a major part of
 the array of cells, and
- c) a probe relatively movable across the

working surface into register with any of the cells of the array, and circuit means associated with the co-ordinate position sensing device and actuable to produce a co-ordinate signal pair uniquely significant of the position, in its array, of the cell with which the probe is registered, the said co-ordinate signal pair therefore being significant of the position of the single character juxtaposed therewith.

By "working stock" is meant a stock of Chinese characters sufficient to enable practicable communication of everyday information, and for the purposes of this specification it is defined as a stock no smaller than the current Toyo Kanji set as used in Japan, which consists of some 2,100 Chinese characters. In this context a similar numerical limit is implied in relation to non-Chinese ideographic scripts.

In detail, as will be explained below, various measures may be taken to increase the access to symbols outside the working stock. In such cases the device further incorporates symbol memory means containing more symbols than are in the working stock.

Terminology

"Morphemic script" and "Linguistic script" are to be understood in the sense used by P. Kratochvil in the book "The Chinese Language Today" (Hutchinson & Co. London 1968).

"Keyboard" is to be understood as signifying a set of symbols arranged in a chart in combination with a machine-compatible record embodying the respective positions of the symbols on that chart.

Brief Description of the Drawing

Figure 1 is a schematic circuit diagram of a device for producing signals significant of the members of a set of Chinese characters,

Figures 2A and 2B are sections taken through two types of position sensing devices suitable for use in the arrangement of Figure 1,

Figure 3 is a circuit diagram of a first modification to the circuit of Figure 1, which enables it to deal with a larger vocabulary than is carried on the sensing device,

Figure 4 is a circuit diagram of a second modification to the circuit of Figure 1 which allows supplementary items to be added to the vocabulary normally carried on the sensing device,

Figure 5 is a table illustrating a number of features relevant to the classification of Chinese characters, and

Figure 6 is a flowchart illustrating the process by which a "keyboard" may be generated.

Description of the Preferred Embodiment

The embodiment of Figure 1 is built up around an analog co-ordinate position sensing device 1, which comprises a square glass panel carrying a transparent resistive coating. This coating is not uniform across the panel, but includes a square array of low resistance areas 2. This arrangement may conveniently be achieved by either of the means illustrated in Figure 2. The first means, illustrated in Figure 2A, involves coating a glass substrate 3 with a thin layer 4 of transparent, electrically conducting material of the type known in the art for coating the cell walls of liquid crystal displays, then applying a resist in a square lattice pattern and continuing the coating process. The resist is then removed, and the thickened portions 4' act as low resistance areas, joined by intervening high resistance strips. The second means, illustrated in Figure 2B involves the deposition of the layer 4 on the glass substrate 3 as before, but after application of the resist, a layer of more highly conductive material is coated onto the sheet, providing an array of low resistance areas 5.

The margins of the panel are provided with an array of diodes to enable electric current to be fed across the resistive coating in two orthogonal directions. A number of diodes D_{A1} have their cathodes connected to the upper margin of the panel at pre-set intervals, while their anodes are connected via respective pre-set resistors R_{A1} to a common line A+. The lower margin of the panel is similarly connected through diodes D_{A2} and present resistors R_{A2} to a common line A-. The left and right hand edges of the panel are correspondingly connected to lines B+ and B- via diode and resistor networks D_{B1} , R_{B1} and D_{B2} , R_{B2} respectively.

Current supply to the panel is effected from the terminals 6 and 7 through a commutator circuit 8. The commutator circuit operates upon commands from a control generator 9 to apply electrical potential to the panel alternately in the two orthogonal directions. A probe 10 may be applied to any of the low resistance areas 2 on the board, and the successive values of potential at the probe will represent the co-ordinates of the given area 2 relative to the upper and left hand margins of the board. The probe 10 and the positive terminal 6 form the inputs to an analog-digital converter 11, which has an output circuit 12 at which appear digital signals representative of the co-ordinates of the given area 2.

Owing to uneven current distribution adjacent the corners of the panel, and possible spurious irregularities in the

thickness of the resistive layer or layers, it may be necessary in any given case to adjust the current feed along the margins of the panel. This may be done by adjustment of the preset resistors R_A , R_B to secure uniform current flow in the panel. The number of diodes on each margin of the panel varies with size, but in the case of a panel slightly over 75 cm. square, carrying one hundred rows each containing one hundred square areas 2, twelve or fifteen diodes will be used on each side. It is also feasible to make the adjustment by varying the spacing between the diodes. In either case, the correction is made once and for all. Another technique is to correct the signals from the probe 10 by logical means, such as an interpolation method if the resistance of the panel is sufficiently regular, or a conversion table if the variations are too large for successful interpolation.

If now a sheet carrying an array of ten thousand Chinese characters set out on a rectangular grid of 7.5 mm. pitch is secured beneath the panel with the centres of the characters in register with the square regions 2, it is clear from the foregoing description that application of the probe 10 to any given square area 2 will, upon operation of the control generator 9, cause a digital signal to appear at the output circuit 11, the signal being uniquely significant of the character beneath the given square area 2. In practice it is found convenient to trigger the control generator by means of a microswitch mounted in the probe itself, so that the mere application of the probe to the surface causes generation of signals at the output. It will be appreciated that the invention enables the direct encoding of Chinese character information into machine-compatible form, thus eliminating that quantum of human error which is inherent in the use of code books or look-up tables. Furthermore, even with a stock of ten thousand characters, the resolution of the device is coarse enough for it to be considered to produce a given functional signal for a cell of its surface, rather than a signal varying substantially continuously from point to point. This enables good discrimination between adjacent characters to be achieved, and as a practical expedient, the high-resistance lattice on the panel may be covered by an opaque, electrically insulating lacquer to prevent contact by the probe 10.

As thus far described, the apparatus is suitable for linguistic frequency checks, vocabulary listings, and similar operations where immediate print-out is not required, and the time-factor would enable the accumulated listings (made, for example, on perforated tape punched in a perforator

13 driven from the output circuit 12) to be manually decoded. However, the present invention can be exploited much more effectively when combined with ancillary equipment for producing graphic output in response to signals such as those appearing at the output 12 of the apparatus of Figure 1. A number of different types of such ancillary equipment can be envisaged, but all have the common feature that graphic information (which is basically analog in nature), corresponding to the stock of symbols carried on a sheet located beneath the panel 1, is stored for selective retrieval in response to the signals on the output 12.

In one particular arrangement, the graphic information is stored in digital form in a random-access memory. Each symbol is regarded as being constructed from a number of vectors on a 16x16 point grid, and the vector or vectors corresponding to the respective symbols are stored in the memory as digital signals for selective recall in response to signals of the kind appearing on the output circuit 12 in Figure 1. During recall, the signals read from the memory may be passed to a plotting machine which may be, for example, an electro-mechanical graph plotter, or an electro-optical device such as that marketed under the name "Laser Scan". The plotting machine will then draw those symbols which are selected by the probe 10.

It will be readily appreciated that the type of signals produced either at the output 12 in Figure 1 or at the output of the random-access memory described above is such that they may be transmitted by telegraph or radio channels to any distance and to any number of recipients, so that long-distance transmission of Chinese text is readily feasible.

Before proceeding to a further description of the circuits of the invention, it will now be opportune to discuss the novel "keyboard" of the invention. This will be done in terms of Chinese characters, and for present purposes it is assumed that ten thousand separate characters are to be included in the character stock. By way of introduction we set out in Figure 5 a table using four Chinese characters to illustrate certain terms which will occur in the following description.

The first line in the table contains the four characters. The second line shows the Modern Standard Chinese pronunciation of each of the characters, using the transcription which is now standard in the People's Republic of China and is known as the Pinyin system. It will be noted that each of the transcriptions includes a diacritic sign, and the characters have been selected so that each of the four diacritic signs used in the Pinyin transcription is represented.

These diacritic signs represent approximately the pitch contour of the character when spoken in isolation, and are identified by the numerals 1 to 4, as shown in the third line of the table.

Although the Pinyin system has enabled characters to be arranged in alphabetical order, the traditional Chinese system of ordering characters has been the radical system, according to which 214 recurrent character components, or "radicals", are identified, and each Chinese character is classified according to which radical it contains. In many cases a character contains more than one radical, and one only is selected according to rules and custom. Within the broad classification of characters having a given radical, the individual characters are customarily arranged in numerical order of the number of written strokes in the remaining part of the character. In each of the cases in the table, the left-hand side of the character constitutes the radical and the radical numbers are given in the fourth line of the table. The number of strokes in the right-hand side of each of the characters is given in the fifth line of the table. The sixth and final line of the table gives the code allocated to the characters by the standard Telegraphic Code which is used for coding Chinese texts for transmission over conventional communication systems.

A first example of the invention will now be described. In this example the task performed is the conversion of a keyboard of Chinese characters arranged according to the sequence of the Standard Telegraphic Code to a keyboard in which the characters are re-ordered into an alphabetic sequence using the Pinyin transcription system.

The starting point of the conversion is a magnetic tape carrying 15,000 records, each relating to a corresponding Chinese character. Each record contains signals defining the following information:

- a) A specification to cause a plotter to draw the character,
- b) The Pinyin transcription of the character,
- c) The tone associated with the character,
- d) The radical under which the character is classified according to the conventional radical/phonetic classification, and
- e) The stroke-count of the character excluding the radical.

Furthermore, the position of the record in the sequence is defined by its Standard Telegraphic Code number.

The information on the tape is transferred to a random access store in a computer, and a storing program is then implemented to generate and store a new

sequence of the records in which the arrangement follows the successive subdivision:

- a) Alphabetic order of Pinyin transcription,
- b) Numerical order of tone,
- c) Numerical order of radical,
- d) Numerical order of stroke count,
- e) Order of Standard Telegraphic Code numbers.

This new sequence is then operated upon by the computer to drive a plotter, according to the following program:

A) The computer is conditioned to drive a plotter to draw the desired outline of new keyboard, subject to the following parameters:

- 1) The overall size of the keyboard,
- 2) The number of rows and columns of keyboard cells,
- 3) The scale of the characters to be drawn,
- 4) The orientation of the keyboard relative to the plotter, and
- 5) The colour to be used.

B) The computer is then conditioned to drive the plotter to fill the cells of the keyboard sequentially with reference to the new sequence of records in store. The process is illustrated diagrammatically in the form of a flow-chart in Figure 6, which illustrates the program for plotting the chart of characters, line by line. As a result of this program, the lines of the chart are filled successively from left to right. At the left-hand margin of the first line the Pinyin transcription of the first character is printed in, for example, red, to contrast with a frame colour of, say green. The characters with this transcription are drawn in successive cells along the line in a given colour until the test on tone gives a positive answer, when the colour is changed. This colour is used until there is a further tone change, when the original colour is resumed. An alternative would be to test the number of the tone, and draw in four distinctive colours. When the Pinyin transcription changes, the new transcription is printed in red in the next available cell, and the process continues as before. When the plotter has drawn a character, the description of the character (including details of shape, size, colour, orientation and position) are recorded to form part of the set of data which together with the printed sheet from the plotter will form the keyboard of the invention.

When the end of the first line is reached, the Pinyin transcription of the last character is printed in the right-hand margin, and a line is drawn beneath the row of characters just plotted. The program then moves on to start the second line similarly to the first, and the whole process

is repeated until the set of records is exhausted. At this stage, the printed sheet from the plotter and the record which has been progressively accumulated, together form the complete "keyboard" of the invention, and can be used in relation to Figures 1 through 4 of the accompanying drawings.

In an alternative operation, the positions of characters on the "keyboard" are altered manually. The sorting is carried out by placing the chart of the existing "keyboard" on a digitiser, and reading the corresponding set of drawing specifications sequentially into random access memory in a computer. The computer is programmed to build up a conversion table in its store in such a way that by identifying two cell on the chart in sequence, the position of the first-identified cell is recorded in the location appropriate to the second-identified cell. Thus by identifying a series of pairs of cells, the sequence of positions in the conversion table may be shuffled out of numerical order. An internal check is provided to ensure that attempts to enter two positions into a single location in the conversion table are notified to the operator for correction. If other changes are required to be made to the descriptions of the characters, these are instructed via the digitiser keyboard and written into the conversion table. The program then causes the computer to re-write the records in the random access store to order them according to the contents of the conversion table, thus producing a new set of records which can be used in a program of the general kind illustrated in Figure 6 to plot a new chart and produce a new set of data.

As well as producing "keyboards" with differing uses of classification, it is possible to produce a "keyboard" with a smaller number of symbols than the original "keyboard", with any desired basis of deletion of symbols. In one particular arrangement, the deletion of symbols is done on the basis of frequency of usage, the least common symbols being eliminated. It is also possible to arrange the symbols in the chart in an order dependent upon the frequency of their usage, so that, for example, the most commonly used symbols are grouped at the centre of the chart and less common symbols are located towards the periphery. This process can be carried out by using the output from equipment of the kind described in Figures 1 through 4 of the accompanying drawings, to build up a record of frequency of usage of the symbols during its normal use. This record can then be used to sort the order of the symbols.

Having now demonstrated the feasibility of producing data-handling systems for Chinese text in which a full vocabulary of

ten thousand characters is employed, various refinements of the system will now be discussed, according to which the practical use of the invention is facilitated.

Firstly, it is possible within the invention to use a panel which can accommodate a reduced number of characters, without losing the facility for handling the whole set of ten thousand in machine-compatible form. This approach relies upon the fact that a vocabulary of some 3,500 characters will cover around 90% of most average texts, so that the increased speed of operation of the system resulting from a smaller and more comprehensible chart will outweigh the delay in dealing with characters not directly on the chart. To enable these latter to be dealt with within the apparatus of the invention, the chart of characters includes additionally sufficient coding symbols (such as alphabetic and numerical characters) and "mode" items (such as "start character code" and "end character code") to enable generation of identifying codes for those characters not included in the basic chart. Figure 3 illustrates a system which would operate in conjunction with such a chart. The analog/digital converter 11 of Figure 1 is connected to a discriminator 14 which, for signals generated in response to character selection, acts to pass those signals directly to ancillary equipment 13 for storage or print-out. The discriminator is, however, sensitive to the signals produced in response to selection of the "mode" items, and on receipt of a signal "start character code", the discriminator 14 passes succeeding code symbol signals to a register 15 until receipt of the signal "end character code" causes the discriminator to revert to its normal state and also causes the register to pass the stored code to the ancillary equipment 13. In this way the whole ten thousand character vocabulary is available for machine handling or print-out. It will be observed, however, that even if one hundred chart positions are reserved for alphabetic and numerical symbols, punctuation marks, functional instructions to print-out machinery, and the like, over 97% of the area of the chart will be available for direct selection of characters.

It is also possible to employ a limited rearrangement of the "keyboard" chart to enhance the speed of operation without the necessity for re-drawing of the chart. Thus, if the chart is deliberately left with a clear column, it is possible to identify a code sequentially as described in relation to Figure 3, but to terminate the code by identifying a given one of the blank spaces with the probe. The arrangement of Figure 4 employs a three-way discriminator 14. Signals corresponding to filled chart

positions pass directly on line 14a to the ancillary equipment 13. The discriminator will detect "start character code" and cause subsequent signals to pass on line 14b to the register 15. If the code is followed by "end character code", the discriminator will cause the register contents to be transferred on line 15a to the ancillary equipment, after which subsequent signals will again appear at line 14a. If, however, the code sequence is terminated by a signal corresponding to a blank position in the chart, the discriminator will identify the corresponding part of a conversion table 16 over line 14c and will instruct the register 15 to transfer its contents to that part. The chart can then be supplemented by hand. The conversion table has capacity to accommodate data in respect of the whole clear column of the chart, and in this way, those infrequent characters which for a given type of text have an above-average frequency, may be "upgraded" for instant access, since subsequent identification of previously blank chart positions will be directed over line 14c to the relevant part of the conversion table 16, which will produce at its output the code appropriate to the marked-in character. This supplementary column can, of course, be modified and re-modified at will. Clearly, if one is dealing with a centralised unit, in which all data is transferred by a conversion table (located in the "ancillary equipment" block 13) such a specialised circuit as indicated in Figure 4 is not required.

The specific arrangements disclosed above are intended to be exemplary only, and of a non-limiting nature. In particular, the output of graphic information may be effected by means other than line-by-line graphical assembly of the characters or other symbols. We intend specifically that our invention shall be used in conjunction with optical image storage, since this avoids the cumbersome process of converting complex graphical shapes, which are inherently analog in nature, into digital form, when the desired end product is a reproduction of the original graphical shape. The optical information will obviously be such as to embody the positions of the respective symbols in the corresponding "keyboard" chart, and will be employed in scanning machinery responsive to the signals produced by the co-ordinate position sensor.

It will be understood that a system suitable for the encoding of Chinese characters will be suitable for the encoding of other morphemic linguistic scripts, and that there is no essential difference between its use with Chinese characters and that with any other script having a comparable number of discrete symbols.

WHAT WE CLAIM IS:—

1. A system for encoding the members of a working stock (as hereinbefore defined in relation to Chinese characters) of Chinese or other ideographic characters, comprising in combination a co-ordinate position sensing device having
 - a) a working surface divided into an array of discriminable cells,
 - b) an array containing the characters of the stock, this array being juxtaposed in register with at least a major part of the array of cells, and
 - c) a probe relatively movable across the working surface into register with any of the cells of the array,
 and circuit means associated with the co-ordinate position sensing device and actuable to produce a co-ordinate signal pair uniquely significant of the position, in its array, of the cell with which the probe is registered, the said co-ordinate signal pair therefore being significant of the position of the single character juxtaposed therewith.
2. A system as claimed in Claim 1, in which the array further contains a set of indicia in register with corresponding cells of the working surface; and the circuit means is so arranged that the indicia can be sequentially selected by the probe to build up data significant of characters not included in the working stock.
3. A system as claimed in Claim 1 or Claim 2, in which the working surface includes at least one cell which is not in register with either characters or indicia.
4. A system as claimed in any one of Claims 1 to 3, further including output means connected to the circuit means to generate, on receipt of a co-ordinate signal pair, the character signified by the signal pair.
5. A system as claimed in Claim 4 in which the output means is capable of generating more characters than are included in the working stock.
6. A system as claimed in any one of Claims 1 to 5, in which for any character the corresponding co-ordinate signal pair is produced irrespective of the precise location of the probe in relation to the area of the respective cell.
7. A system as claimed in Claim 6, in which the working surface is transparent.
8. A system as claimed in Claim 6 or Claim 7, in which the working surface comprises a panel carrying a resistive coating the resistivity of which varies across the panel.
9. A system as claimed in Claim 8, in which said coating effectively comprises a square lattice of relatively high resistance containing within its meshes square areas of relatively low resistance.
10. A system as claimed in Claim 9, in



positions pass directly on line 14a to the ancillary equipment 13. The discriminator will detect "start character code" and cause subsequent signals to pass on line 14b to the register 15. If the code is followed by "end character code", the discriminator will cause the register contents to be transferred on line 15a to the ancillary equipment, after which subsequent signals will again appear at line 14a. If, however, the code sequence is terminated by a signal corresponding to a blank position in the chart, the discriminator will identify the corresponding part of a conversion table 16 over line 14c and will instruct the register 15 to transfer its contents to that part. The chart can then be supplemented by hand. The conversion table has capacity to accommodate data in respect of the whole clear column of the chart, and in this way, those infrequent characters which for a given type of text have an above-average frequency, may be "upgraded" for instant access, since subsequent identification of previously blank chart positions will be directed over line 14c to the relevant part of the conversion table 16, which will produce at its output the code appropriate to the marked-in character. This supplementary column can, of course, be modified and re-modified at will. Clearly, if one is dealing with a centralised unit, in which all data is transferred by a conversion table (located in the "ancillary equipment" block 13) such a specialised circuit as indicated in Figure 4 is not required.

The specific arrangements disclosed above are intended to be exemplary only, and of a non-limiting nature. In particular, the output of graphic information may be effected by means other than line-by-line graphical assembly of the characters or other symbols. We intend specifically that our invention shall be used in conjunction with optical image storage, since this avoids the cumbersome process of converting complex graphical shapes, which are inherently analog in nature, into digital form, when the desired end product is a reproduction of the original graphical shape. The optical information will obviously be such as to embody the positions of the respective symbols in the corresponding "keyboard" chart, and will be employed in scanning machinery responsive to the signals produced by the co-ordinate position sensor.

It will be understood that a system suitable for the encoding of Chinese characters will be suitable for the encoding of other morphemic linguistic scripts, and that there is no essential difference between its use with Chinese characters and that with any other script having a comparable number of discrete symbols.

WHAT WE CLAIM IS:—

1. A system for encoding the members of a working stock (as hereinbefore defined in relation to Chinese characters) of Chinese or other ideographic characters, comprising in combination a co-ordinate position sensing device having

- a) a working surface divided into an array of discriminable cells,
- b) an array containing the characters of the stock, this array being juxtaposed in register with at least a major part of the array of cells, and
- c) a probe relatively movable across the working surface into register with any of the cells of the array,

and circuit means associated with the co-ordinate position sensing device and actuatable to produce a co-ordinate signal pair uniquely significant of the position, in its array, of the cell with which the probe is registered, the said co-ordinate signal pair therefore being significant of the position of the single character juxtaposed therewith.

2. A system as claimed in Claim 1, in which the array further contains a set of indicia in register with corresponding cells of the working surface; and the circuit means is so arranged that the indicia can be sequentially selected by the probe to build up data significant of characters not included in the working stock.

3. A system as claimed in Claim 1 or Claim 2, in which the working surface includes at least one cell which is not in register with either characters or indicia.

4. A system as claimed in any one of Claims 1 to 3, further including output means connected to the circuit means to generate, on receipt of a co-ordinate signal pair, the character signified by the signal pair.

5. A system as claimed in Claim 4 in which the output means is capable of generating more characters than are included in the working stock.

6. A system as claimed in any one of Claims 1 to 5, in which for any character the corresponding co-ordinate signal pair is produced irrespective of the precise location of the probe in relation to the area of the respective cell.

7. A system as claimed in Claim 6, in which the working surface is transparent.

8. A system as claimed in Claim 6 or Claim 7, in which the working surface comprises a panel carrying a resistive coating the resistivity of which varies across the panel.

9. A system as claimed in Claim 8, in which said coating effectively comprises a square lattice of relatively high resistance containing within its meshes square areas of relatively low resistance.

10. A system as claimed in Claim 9, in



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which the lattice and the square areas consist of the same material, the square areas being more thickly coated than the lattice.

5 11. A system as claimed in Claim 9, in which the panel carries a uniform coating of high resistivity material over which is coated an array of square areas of a low resistivity material.

10 12. A system as claimed in Claim 9, in which the circuit means includes an analog-digital converter.

15 13. A system as claimed in Claim 12, in which the circuit means includes provision for compensating for spurious variation of resistivity of the coating.

20 14. A system as claimed in Claim 13, in which the circuit means is connected to the margins of the coating by a network of diodes and the provision for compensation comprises a corresponding set of resistors

connected in series with the respective diodes.

15. In a system as claimed in Claim 4 or Claim 5, the combination of a chart on 25 which the characters of the working stock are marked and which is carried in juxtaposition to the working surface of the coordinate position sensing device for selection by the probe, and a machine-compatible record of the graphic forms of 30 the characters of the working stock, the organisation of which record embodies the respective position of each character on the chart. 35

16. A system as claimed in Claim 1 and substantially as hereinbefore described with reference to the accompanying drawings.

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