

## UNIT FOR DISPLAY OF INFORMATION ON A READING DEVICE FOR THE BLIND

This application is related to copending application Ser. No. 688,584 filed Jan 3, 1985 in the name of Joachim Burchart and assigned to Nixdorf Computer AG of Paderborn, West Germany.

### FIELD OF THE INVENTION

The invention relates to a tactile reading apparatus for the blind which is capable of displaying both graphics and alphanumeric characters.

### BACKGROUND OF THE INVENTION

In such reading tables a plurality of character fields is generally provided each of which shows the number of character elements required for displaying one Braille character. These character fields, also known as Braille forms, are assigned to one or even more Braille lines on the reading table. For a distinct separation of the characters from one another, spaces are provided between adjacent Braille forms which are larger than the spacing between two rows of points in one character.

With an arrangement of this kind, generally only characters provided in Braille code, e.g. alphanumeric characters, can be reproduced. Larger graphic displays or the like extending out beyond the individual Braille forms cannot however be reproduced or be reproduced free of distortion by reason of the character elements arranged in the fields. Hence, the conventional reading tables in particular are unsuited for the reproduction of video text pages, viewing screen text pages or the like, which generally contain letter and graphic displays.

A unit is already known for reproducing video text pages for the blind which serves for reproducing a viewing screen line in writing readable by the blind (German Offenlegungsschrift No. 3,112,438). This viewing screen line can be reproduced in one or a plurality of Braille lines. Hence, in this known apparatus all characters which are not letters provided in Braille code are suppressed. Any reproduction of graphic displays or of large letters composed of graphic symbols or the like is impossible with this unit.

### SUMMARY OF THE INVENTION

It is the problem of the present invention to create a unit of the type of this species which also permits the display of graphics extending out beyond the individual Braille form, large letters and the like and which for this reason is particularly suitable for representing video text pages, viewing screen text pages or the like.

This problem is solved according to the invention by providing a reading board or the like having a reading surface which contains a dense two-dimensional array of uniformly spaced character elements each of which is susceptible of both raised and lower dispositions relative to the surface and further by providing input and encoder means responsive to alphanumeric character data to actuate only certain sub-arrays but responsive to graphic input data to ignore the sub-array division and effectively access the entire board.

The character elements are arranged in a dense matrix with uniform line and column spacings, that is, the whole reading table is uniformly occupied by character elements. For the display of characters in Braille print, certain respective character fields are used which are separated from each other by at least one row of charac-

ter elements. Each of these character fields is intended for the display of one Braille print character. The character elements arranged between the character fields and separating these have no function, that is they are cleared, so that distinct spaces exist between the individual characters. For the display of graphics or the like all of the character elements can be used, whereby, depending on the arrangement density of the character elements, a more or less good definition is obtained.

For displaying video text pages, viewing screen text pages or the like, it is provided in one development of the invention that the reading table shows a number and arrangement of character fields corresponding to the number and arrangement of the characters of a viewing screen page.

By the present standard the viewing screen page has 24 lines each with 40 characters. The reading table then likewise shows 24 lines with 40 character fields each, where the individual character fields are respectively surrounded on all sides by other character elements either in one row or else in a number of rows, as has already been described.

In order for the display of one viewing screen page to come as close as possible, it is further provided according to the invention that the inner character fields are formed as Braille forms preferably with 8 character elements and that each Braille form is framed on all sides with one row of character elements and are completed to form a partial matrix or an outer character field with preferably  $4 \times 6$  character elements. The characters represented on the viewing screen by a  $5 \times 10$  matrix are reproduced by a Braille form with  $2 \times 4$  character elements.

Each outer character field with  $4 \times 6$  character elements can also be conceived of as a matrix block which respectively contains  $2 \times 3$  matrix elements, where each of the matrix elements in turn is composed of  $2 \times 2$  character elements. Such matrix block is particularly suitable for the reproducing of graphic symbols used in the video text or viewing screen text process for the composition of graphics, as is described in more detail further on. It may be mentioned that the division of the totality of all the character elements into individual partial matrices or character fields need not be externally visible. This division instead can be done purely by organizing the circuit details and serves only for determining defined character fields for the display.

In a preferred development of the invention the means for setting and clearing the character elements include the operating drives respectively assigned to these as well as a control unit for driving these operating drives. The control unit shows a memory unit which can be connected to a viewing screen unit or the like for storing at least the information signals forming one viewing screen page and a character generator for converting these information signals into a tactile character pattern corresponding to the viewing screen page as well as for driving the character elements corresponding to this character pattern. Viewing screen units here is understood to mean quite generally all units suitable for generating viewing screen pages, and thus for example, also receiving components provided with video text or viewing screen text decoders, such as video recorders or the like. The information signals corresponding to the viewing screen page are accepted in that memory unit and fed to a character generator which converts these information signals into a character pattern displayable on the reading table. The charac-