Nov. 13, 1956 H. T. MARCY 2,770,061

DISPLAY APPARATUS

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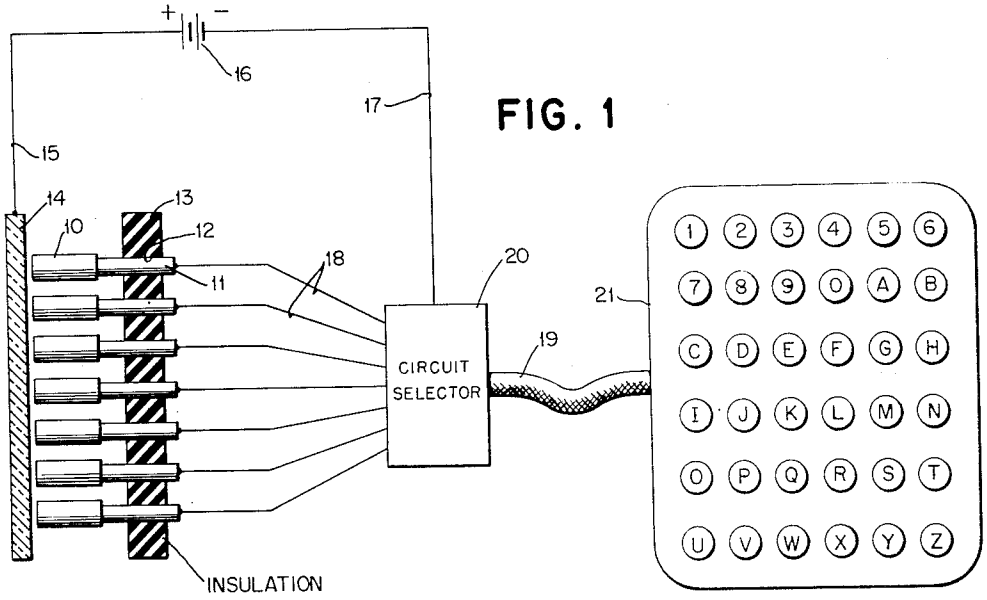


FIG. 1

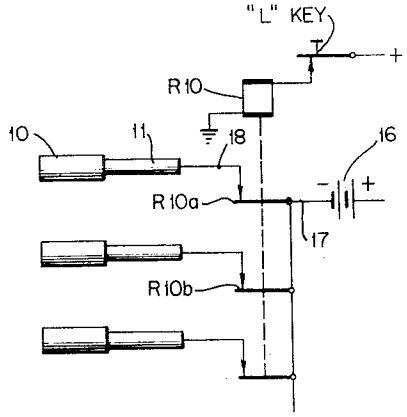


FIG. 3

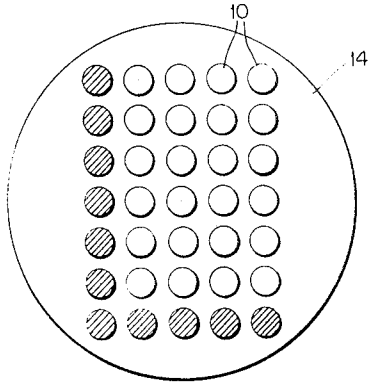


FIG. 2

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DISPLAY APPARATUS

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5 Claims. (Cl. 40—52)

This invention relates to apparatus for displaying numerals or characters and more particularly to an electrostatic arrangement for selecting and controlling the display.

In the prior art, numerous electro-mechanical display devices exist wherein the display of a numeral or a character can be controlled from a keyboard located at any convenient point. None of these devices utilizes an electrostatic arrangement for effecting the display. It is, therefore, the principal object of the present invention to provide an improved display apparatus wherein the display of numerals and characters is effected through devices which are electrostatically operated.

More specifically, it is an object of the invention to provide a display apparatus wherein a plurality of semi-conductive elements are positioned closely adjacent but spaced from one side of a conductive transparent sheet, the application of an electrical potential difference between the adjacent surfaces of a selected number of the elements and the transparent sheet causing a numeral or character display.

Briefly, the display apparatus of this invention includes a conductive glass sheet and a plurality of semi-conductive rubber elements arranged in a matrix array in juxtaposition to one side of the glass sheet. Means are provided for placing electrical charges of different polarities on the adjacent surfaces of selected elements of the matrix array and the glass sheet, whereby the selected elements are attracted to the sheet and stretched into contact with the sheet to represent either a numeral or a characer.

Other objects of the invention will be pointed out in the following description and claims and illustrated in the accompanying drawings, which disclose, by way of examples, the principle of the invention and the best mode, which has been contemplated, of applying that principle.

In the drawings:

Fig. 1 is a diagrammatic view showing the preferred embodiment of the display apparatus of this invention.

Fig. 2 is a front view showing the positions of the rubber elements in the matrix array and the elements which form the letter "L" shaded.

Fig. 3 is a diagram showing a circuit arrangement for connecting selected rubber elements in the matrix array to a source of electrical potential.

Referring to Fig. 1 of the drawing, a row of semi-conductive rubber elements **10** is shown, each element being carried by an individual conductive stud **11**. Each of the conductive studs are inserted in suitable slots or openings **12** formed in a supporting block **13** which is made of suitable insulating material. The studs **11** are held frictionally in the indicated positions in the blocks **13**. The rubber elements **10** are arranged in a matrix array comprising five rows of elements, there being seven elements in each row as shown in Fig. 2. The rubber elements **10** are positioned closely adjacent but spaced from

one side of a conductive transparent glass sheet **14**. The term "semi-conductive" as applied to the rubber elements **10** means that the rubber has conductive properties but also has a very high resistance. It has a high enough resistance to prevent arcing between the rubber and glass sheet **14** when an electrical potential difference is applied between adjacent surfaces of a rubber element **10** and the glass sheet **14**. When a selected number of the rubber elements are drawn against the glass sheet **14**, the glass is given a mirror quality to display a numeral or character as described hereinafter.

The glass sheet **14** is shown in Fig. 1 connected through a lead **15** to a positive side of a battery **16**. The negative side of battery **16** is connected through lead **17** to a circuit selector device represented by the box designated **20** in Fig. 1. The circuit selector device has a lead wire **18** extending to each conductive stud **11**. A cable **19**, containing suitable wiring, connects the circuit selection device to a keyboard **21**. This keyboard and circuit selector may be of the type disclosed in U. S. Patent No. 1,799,731, issued April 7, 1931 to A. V. Cassels wherein the subject matter of a display device can be composed and changed at will from a typewriter keyboard through through circuitry which selects certain positions in a seven by five matrix array to represent the character indicated on the keyboard.

Operation

In order to explain the operation of this display device let it be assumed that the letter "L" key is depressed on keyboard **21**. The circuit selector **20** is arranged to connect the rubber elements **10** required to form the letter "L" to the negative side of the battery **16** through related lead wires **18** upon actuation of the "L" key on keyboard **21**. In Fig. 3 the "L" key is shown depressed to pick up a relay R**10** which closes its contacts R**10***a*, R**10***b*, etc., to connect the related rubber elements **10** to the negative side of battery **16** in a manner similar to that disclosed in the forementioned patent to A. V. Cassels. The positive side of the battery is already connected to the glass sheet **14**, as explained previously. The adjacent surfaces of the glass sheet and the selected rubber elements **10** then have a positive and negative charge respectively. This means that electrons have been displaced through the circuit, and that there is an excess of electrons on the negative rubber elements **10** and a deficiency of electrons on the positive glass sheet **14**. The magnitude of the voltage supplied by the battery **16** is sufficiently high to produce the electrostatic effect described above. The rubber elements having the negative charge are attracted by the glass sheet **14** which has an opposite charge. These selected rubber elements stretch until they come into contact with the glass sheet, thereby giving the glass a mirror quality in the selected position. The stretched rubber elements will remain in contact with the glass until such time that the potential difference between the adjacent surfaces of the glass sheet and selected rubber elements is removed. The letter "L" is thus formed by the selected rubber elements as shown by the shaded areas in Fig. 2. The electrostatic effect described herein is similar to the phenomenon described in U. S. Patent Nos. 1,533,757 and 2,630,512 issued to K. Rahbek, et al. and K. Rahbek, respectively.

To summarize, in the display apparatus of the present invention numerals and characters are represented by selected positions in a matrix array. A semi-conductive rubber element is located in each position of the matrix array. These elements are positioned closely adjacent but spaced from one side of a conductive glass sheet. Means is provided to apply electrostatic charges of opposite polarities to the adjacent surfaces of the elements in selected matrix positions and the glass sheet, whereby

the elements in the selected positions are attracted to the sheet and stretched into contact with the sheet to represent either a numeral or a character.

While there have been shown and described and pointed out the fundamental features of the invention as applied to a preferred embodiment, it will be understood that various omissions and substitutions and changes in the form and details of the device illustrated and in its operation may be made by those skilled in the art without departing from the spirit of the invention. It is the intention, therefore, to be limited only as indicated by the scope of the following claims.

What is claimed is:

1. Apparatus for displaying information, comprising a conductive transparent sheet; a plurality of semi-conductive elements, said elements being positioned closely adjacent but spaced from one side of said sheet; means for applying a potential difference between the adjacent surfaces of selected ones of said elements and said sheet, whereby the selected elements are attracted to the sheet.

2. Apparatus as set forth in claim 1, in which the conductive transparent sheet is composed of glass and the semi-conductive elements are composed of rubber, selected ones of said elements being stretched into contact with the glass sheet when there is a potential difference between the adjacent surfaces of the selected elements and said sheet.

3. Apparatus for displaying information, comprising a conductive transparent sheet; a plurality of semi-conductive elements, said elements being positioned closely adjacent but spaced from one side of said sheet; a source of electrical potential; means for placing electrical charges of different polarities on the adjacent surfaces of a selected quantity of said elements and said sheet, whereby the selected elements are attracted to the sheet.

4. Apparatus for displaying information, comprising a conductive glass member; a plurality of semi-conductive rubber elements arranged in a matrix array in juxtaposition to one side of said glass member, means for applying a potential difference between adjacent surfaces of selected elements of said array and said glass member, whereby the selected elements are stretched into contact with the glass member to represent either a numeral or a character.

5. In an electrostatically operable display apparatus in which numerals and characters are represented by selected positions in a matrix array, a conductive transparent sheet; a plurality of semi-conductive elements located in each position of said matrix array, said elements being positioned closely adjacent but spaced from one side of said sheet; means for applying electro-static charges of opposite polarities to the adjacent surfaces of the elements in selected matrix positions and said sheet, whereby the elements in the selected positions are stretched into contact with the transparent sheet to represent either a numeral or a character.

No references cited.