FIG. **8** represents the variation of various mechanical forces during the downward motion of the mobile assembly, when no pressure is applied to the tactile dot, its support spring being fully extended. The vertical axis represents the position of the mobile assembly, zero being its halfway position. The horizontal axis represents the values of the individual forces, measured in grams and counted positively when acting upward.

The slightly curved full line represents the traction force sustained by the heated wire to keep the assembly moving. The dotted line represents the vertical projection of the cold wire elongation force. The dashed-dotted line represents the vertical projection of the friction forces. The dashed line represents the sum of the vertical projections of the forces exerted by the locking springs and eventually the dot support spring. The full straight line represents the sum of all above vertical forces. The same forces, but with opposite signs are involved in the upward motion when no pressure is exerted on the tactile dot.

FIG. **9** represents the same forces during the downward motion of the mobile assembly, when the tactile dot is kept below the reading surface by a sufficient pressure. It can be seen that the mechanical work required from the heated wire is significantly decreased.

FIG. **10** represents the same forces during the upward motion of the mobile assembly, when the tactile dot is prevented from raising above the reading surface by a sufficient pressure. It can be seen that the mechanical work required from the heated wire is significantly increased. This represents the worst case scenario for which the wires must be designed.

FIG. **11** represents the basic electrical circuit used to generate the current pulse through any shape memory wire. This circuit is of a multiplexed type, in which the current pulse at any dot location is generated by combining electrical signals applied to electric conductors, one for each row and one for each column, in order to minimize the number of electronic parts required for a given number of dots.

In this figure, the wire to be heated is represented by the resistor **22**. One of its ends is connected through the eyelet **23** to the emitter of the NPN transistor **40**, one such transistor being necessary per wire. The other end is connected through the eyelet **24** to an electrical conductor **42** printed on one side of the board **25**, and running across the whole display in a direction parallel to the rows of dots. The collector of the transistor **40** is connected to the pole V2 of a power supply, through a conductive surface printed across the surface of the board **4**. The base of the transistor **40** is connected to an electrical conductor **43** printed on the other side of the board **25**, and running across the whole display surface in a direction parallel to the columns of dots. Similar connections are provided for the bottom wires and transistors.

Each row conductor similar to **42** is connected to another pole V3 of the power supply, through an PNP transistor **51** which base is connected to a PNP driver transistor **52** himself connected to yet another pole V4 of the power supply. The base of the driver transistor **52** is connected to a conductor providing, when required, a row selection electrical pulse.

Each column conductor similar to **43** is connected to a pole V1 of the power supply, through a driver NPN transistor **50**. The base of this transistor is connected to a conductor providing, when required, a column selection electrical pulse.

For a current pulse to flow from the pole V2 of the power supply, via the transistor **40** through the wire/resistor **22** and then via the row conductor **42** and the row transistor **51** to the pole V3 of the power supply, one must apply simultaneously a positive "column" pulse to the base of the column driver transistor **43**, and a negative "row" pulse to the base of the row driver transistor **52**.

The row and column transistors can be mounted on the printed circuit boar& **25**, **4**, **5** and **31** shown on FIG. **1**, on the sides of the display, while the "wire" transistors like **40** and **41** must be mounted in the immediate vicinity of the wire they feed, as shown on the same figure.

Conventional digital control circuits can be used to provide the row and column pulses needed to activate sequentially the top or bottom wire at any selected dot position, because the voltages needed are typically in the 5 to 10 volts range.

By using the above preferred embodiment of the electrical circuits, all required electrical connections are provided by the four horizontal printed circuit boards already used as a mechanical support for the mobile assemblies.

What we claim is:

1. A tactile reading device comprising:

a reading panel having a reading surface and an array of holes therethrough,

a plurality of rods for displaying a dot pattern representing a graphic display above said reading surface which can be read by touch, each of said plurality of rods including a tip extending within one of said holes and being selectively displaceable in a first direction to a first position above said reading surface for display of said dot pattern and a second opposing direction to a second position below said reading surface, and a shape memory wire for effecting displacement of said tip in said first direction and an opposing shape memory wire for effecting displacement of said tip in said second opposing direction, each said shape memory wire being attached to said rod and connected to a voltage source, and

an elastic looking mechanism for each rod such that the tip is maintained in a desired one of said first and second positions, whereby the rod is maintained by the action of the locking mechanism until a contraction of one wire produces a mechanical force which overrides said locking mechanism and effects displacement or the tip in a desired one of said directions, said mechanical force effecting an elongation of the opposing wire thereby biasing said opposing wire for contraction thereof.

2. A tactile reading device according to claim **1**, wherein the shape memory wire is made of an electrically conductive material which can be heated to a shape recovery temperature by an electrical current pulse of sufficient intensity and duration.

3. A tactile reading device according to claim **2**, wherein electrical circuits needed to provide the current pulse to each wire, are or a multiplexed type, comprising one electronic switch for each wire, connected to electrical conductors, at least one for each row and one for each column of said array, in such a way that the electronic switch located at the intersection of a particular row and column is activated by connecting said conductors selectively to the appropriate poles of an electric power supply, by the activation of other electronic switches, at least one for each row and one for each column.

4. A tactile reading device according to claim **3**, wherein said electrical conductors are printed on boards extending parallel to the reading surface, said boards supporting said