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Honegger

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[54] **SOUNDING NOTE BOARD FOR MUSIC INSTRUCTION**

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[52] **U.S. Cl.** **84/471,** 84/1.01, 84/1.04, 84/DIG. 7

[51] **Int. Cl.** **G09b 15/02**

[58] **Field of Search** ..... 84/1.01, 1.04, DIG. 7, 84/470–485; 200/52 R

[56] **References Cited**

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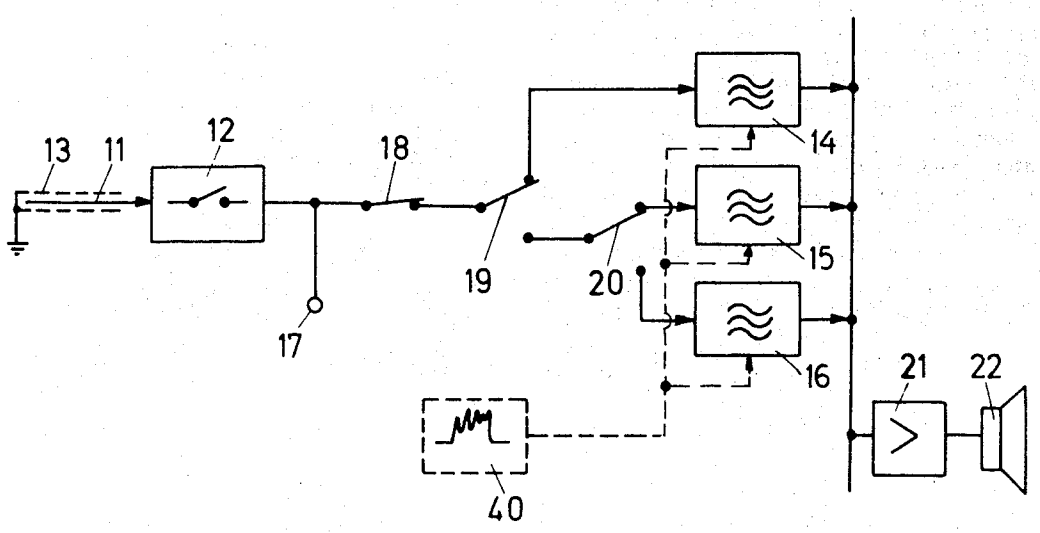
[57] **ABSTRACT**

A sounding note board for music instruction is disclosed, comprising conductor bars being arranged below the board surface. The bars are connected with on/off switching means, each of them being arranged to switch a separate sound generator which is assigned to one particular bar. The output terminals of all sound generators are connected with the input of a common amplifier which feeds a speaker. The switching means are designed to form proximity switches, controlled by the respective bars. The proximity switches are operable by a person touching the board surface above the particular bar. The board provided with an ordinary writing layer may comprise an iron or magnetic layer which is arranged at such a distance from the writing surface that attachable magnetic or iron platelets adhere to the writing surface.

14 Claims, 5 Drawing Figures



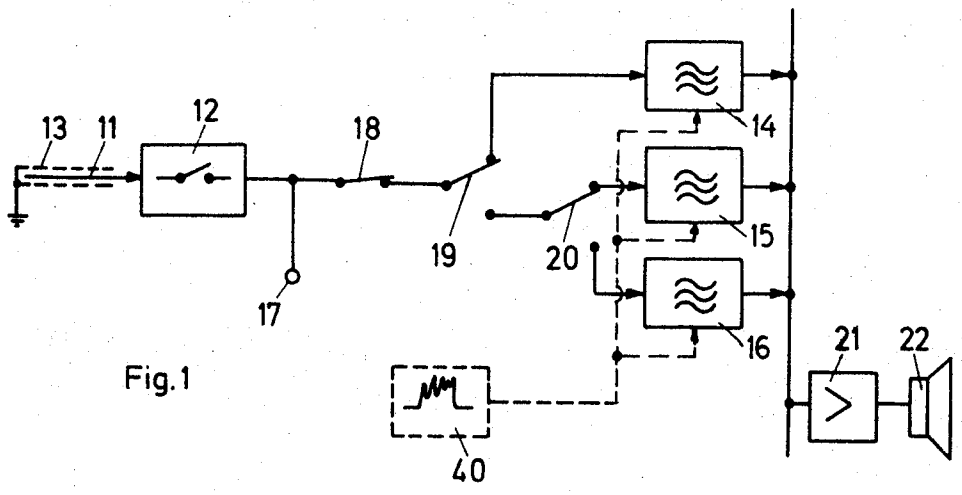


Fig. 1

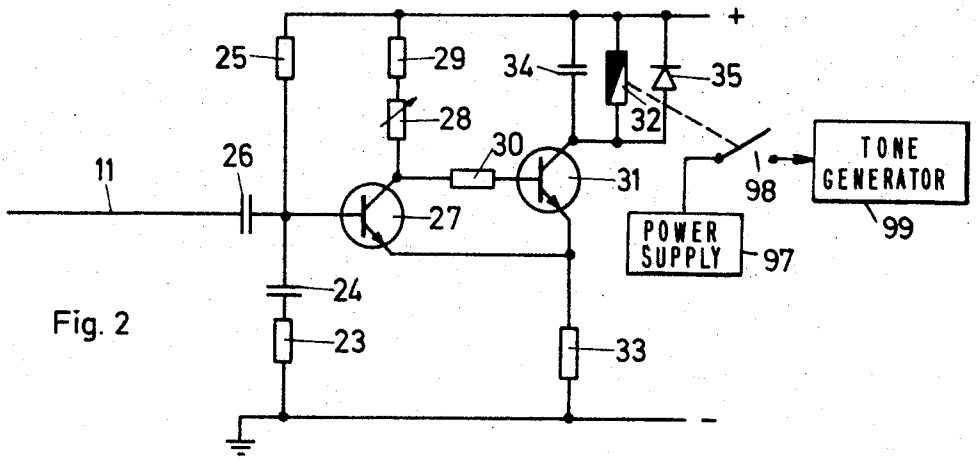


Fig. 2

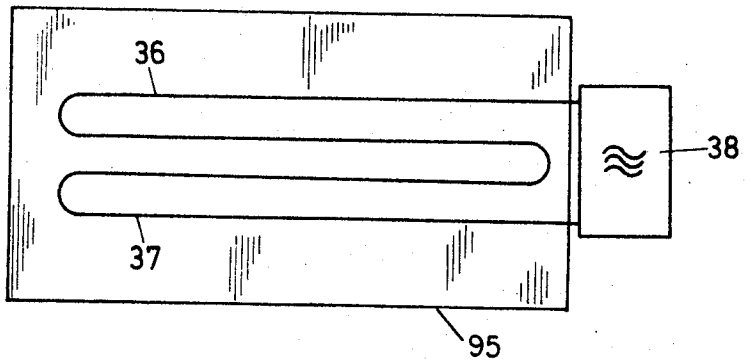


Fig. 3

FIG. 4

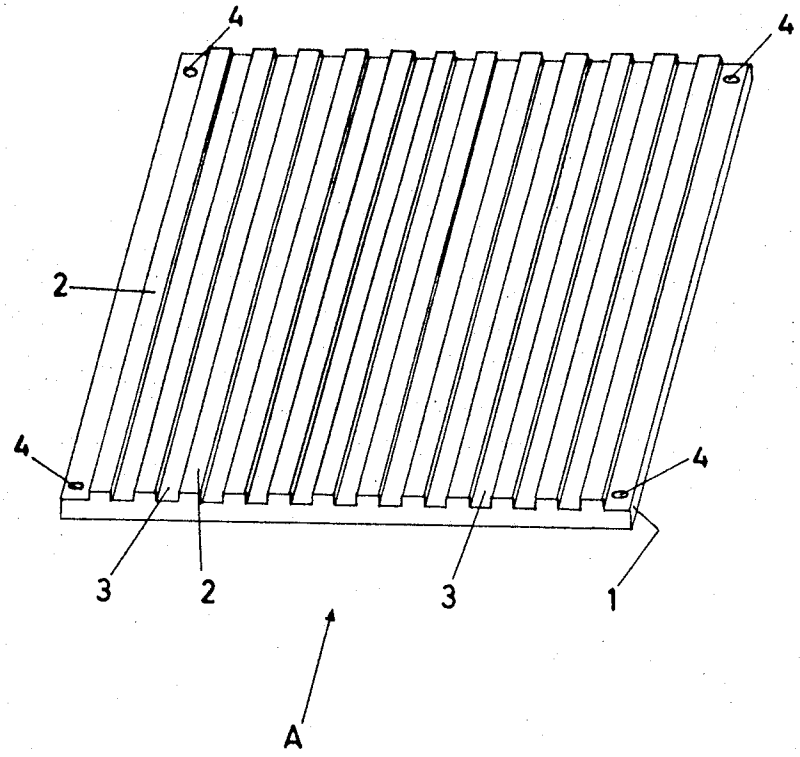
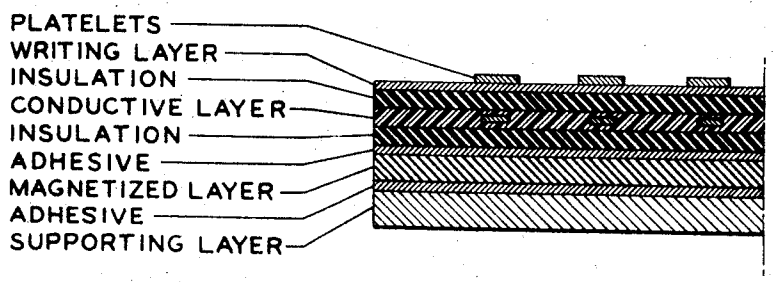


FIG. 5


PLATELETS
WRITING LAYER
INSULATION
CONDUCTIVE LAYER
INSULATION
ADHESIVE
MAGNETIZED LAYER
ADHESIVE
SUPPORTING LAYER

SOUNDING NOTE BOARD FOR MUSIC INSTRUCTION

The present invention concerns a sounding note board for music instruction, comprising conductor bars which are arranged below the board surface and which are each assigned to a particular pitch or tone and which are connected to switching means for the switching-on of the sound generators assigned to the particular pitches or tones.

There are known systems of sounding note boards for music instruction comprising conductor bars arranged below and between the staff lines and each connected to an electric sound generator which, when a note is indicated by a pointer also connected to the said generator, causes the particular tone to sound. In one of the known note boards of this type, the conductor bars are arranged on the board surface, and switch-on of an electric sound generator is effected by galvanic contact between the conductor bar and the pointer.

In another known version, the electric conductor bars are arranged below an insulating writing layer, so that the board can be easily written on. The conductor bars are each connected to a sound generator by a switch, while the sound generators have on their output side a common amplifier connected to a loudspeaker. Connection of a sound generator is effected by touching the board with a cane connected to the board by a cord. Conductor bar and cane carry an alternating voltage, and touching the board capacitively closes an a.c. circuit containing a relay. A drawback of this system is that an electric shock is received when the tip of the otherwise insulated pointer is touched, and the fact that the cane is connected to the board by a cable is also considered a nuisance.

Moreover, it is desirable for an audio-visual presentation of music instruction that the sounded notes should also be visible. Besides the traditional writing-up of the notes with chalk, it is also desirable to represent individual notes, chords or melodies by magnetic markers. There are known boards consisting of an iron plate or coated with an iron-containing compound, so that permanent magnet markers easily adhere to the board. However, this system cannot be readily transferred to a sounding note board according to the present invention. As the electrodes arranged below the board surface may only be a very short distance from the surface in order to ensure certain response of the proximity switches when the electrodes are touched, it is not readily possible to make a board with the necessary electrodes and an iron or magnetic surface meeting the wear and quality requirements of school service. For electrical reasons, the iron or magnetic layer cannot be arranged between electrodes and board surface, as the electrodes would be screened and would not respond. On the other hand, the embedding of conventional electrodes would require such a great layer thickness that the provision of an iron or magnetic layer under the electrodes would not with certainty produce the desires result, as the distance between iron layer and magnetic markers would be too great to ensure proper adherence of the markers.

It is an object of the present invention to provide a sounding note board requiring neither pointer nor cable.

Another object of the present invention is to provide a note board whose material and layer sequence are such that it can also be used as a magnetic board.

The said objects are achieved by the present invention in that the switching means in conjunction with the conductor bars have the form of proximity switches which are operable by a person touching the board surface at the chosen point of the note pattern, for which result a particular signal level at the conductor bar which is fed to the input of the associated switching means is underpassed or exceeded, respectively, under the influence of the person's body capacity, so that, when the particular signal level is exceeded, the sound generator assigned to the particular switching means is switched on.

By suitable choice of material and layer thickness for the writing surface the electrodes and the necessary insulating layers it is possible to obtain the right distance for achieving the second object.

To ensure dependable switching even in a weak ambient field, as in a strongly screening building, a conductor connected to an alternating voltage generator may be fitted into the board or arranged near it for the purpose of exciting a local electric field.

By suitable arrangement of the conductor bars and suitable construction of the board surface it is possible to provide a board which is especially suitable for instructing blind music students.

As the board can be made to sound simply by touching,it, as with the finger, it is also possible to play chords on it by simultaneously touching it with several fingers. This is not possible with a board using a single pointer.

Embodiments of the present invention are now to be described by way of example with reference to the accompanying drawings, in which:

FIG. 1 shows the block circuit diagram of a tone with the associated half-tones;

FIG. 2 shows an embodiment of the proximity switch 11, 12 according to FIG. 1;

FIG. 3 shows a diagram of a ring conductor designed to set up an electric alternating field;

FIG. 4 shows a perspective view of an embodiment suitable for blind students' instruction; and

FIG. 5 is a fragmentary sectional view through the note board, on a magnified scale, illustrating somewhat diagramatically a suitable laminated layer sequence in accordance with the present invention.

The note board comprises conductor bars which correspond to the tones and which are arranged in a board body and are mutually insulated and screened and are located below the board surface, in particular below a writing layer presenting the staff lines. The electrical equipment is arranged at the edge of the board, for instance, along a narrow side and embedded in a recess of the board body.

According to FIG. 1, the electrical assembly for each tone comprises a conductor bar 11 which is connected as an electrode to a switching means 12 and screened from neighbouring conductor bars by a screening 13, and further comprises a sound generator 14 for the key note and two sound generators 15, 16 for the lower and higher half-tones, respectively, a plug socket 17 in the line from the switching means 12 to the sound generators, a switch 18 for cutting off the sound generators, a change-over switch 19 for contacting the key note generator 14 or half-tone generator, and a change-over

switch 20 for contacting the sound generator 15 for the lower half-tone or the sound generator 16 for the higher half-tone. All sound generators are jointly connected to an amplifier 21 which is connected to a speaker 22. The plug socket 17 is designed for connection of other sound generators, such as sound generators of another timbre, or for connection of an electric musical instrument, such as an organ, with provision for playing from the note board to the organ, or from the organ's keyboard to the note board. However, the plug socket 17 can also be used to connect a signal lamp for optical tone indication, possibly with different colours for the individual tones.

The switching means 12, which together with the electrode 11 forms a capacitive proximity switch, is shown in greater detail in FIG. 2. It comprises a resistor 23 connected in series with a capacitor 24; the resistor 23 is connected to the negative terminal, while the capacitor 24 is connected across a resistor 25 to positive terminal connected to an external voltage source. The electrode 11, having the form of a conductor bar, is coupled across a capacitor 26 to that circuit. Also connected to this input voltage divider is the base of a transistor 27, the collector of which is connected across a potentiometer 28 and a resistor 29 to positive potential and is connected across a resistor 30 to the base of a second transistor 31. The collector of transistor 31 is connected to a relay 32 for actuating toner or sound generator 99 by closing switch 98 to energizing power supply 97. The emitters of the two transistors are connected across a joint resistor 33 to negative potential.

In the idle state, i.e., when the note board is not being touched, the collector-emitter circuit of the first transistor 27 carries a low current determined by the values of the resistors 28 and 29.

The base of the transistor 31 is connected to negative emitter potential, so that the transistor is cut off. When the note board is touched with the finger at a point of the conductor bar, this, owing to the capacitive coupling, picks up a substantially stronger ambient signal. This ambient signal is amplified by the transistor 27 and produces a greater voltage drop at the resistor 29. As a result, the base potential of the transistor 31 changes by virtue of the voltage drop across the resistor 30, so that the transistor 31 becomes conductive and energizes the relay 32, switching on the associated sound generator 99. To ensure that the relay 32 is properly energized and does not flutter, a capacitor 34 and a diode 35 are connected in parallel to smooth the amplified a.c. voltage.

As soon as the finger is removed from the note board and the ambient signal picked up by the conductor bar is therefore weakened, the second transistor 31 remains cut off, the relay 32 de-energizes and switches off the sound generator. The response voltage for the second transistor 31 can readily be adjusted by the potentiometer 28.

It is expedient to provide the note board 95 with a ring conductor which is connected to an a.c. voltage generator and which sets up a constant ambient field which is always sufficient to make the switching means respond when the note board is touched. FIG. 3 shows, by way of example, a ring conductor with two loops 36, 37 connected to an a.c. voltage generator 38. Such a ring conductor may preferably be arranged along the lower edge of the board 95 behind the writing layer or at any other point within the influence range of the board.

Instead of using the capacitive proximity switch described, it is of course possible to use any other switch of the type whose switching state changes when approached to the associated conductor bar.

Also, to refine the sound pattern, it is possible to use a so-called wind generator 40, which consists of a noise generator for a particular noise spectrum and which superimposes an adjustable percentage of desired distortion on the generally sinusoidal signal of the sound generators. In this arrangement, the wind generator may be either connected directly in parallel with the outputs of the sound generators, or it may be arranged to act on each sound generator separately, as illustrated in FIG. 1, by distorting the supply voltage. With such a wind generator it is possible to simulate the wind effect of flutes or other wind instruments, for instance. This provides a sound pattern more pleasing than that of the undistorted sinusoidal signal of the sound generators.

To facilitate music instruction, it is convenient to be able quickly to replace a note sequence on the board, such as a melody, by another note sequence, such as another melody. For this purpose, the board may be overlaid with a sheet of felt, for instance, which can be removably affixed by press or adhesive fastenings, for instance, and to which notes or symbols provided with a rough surface can be attached.

Again, it is possible to affix foils, such as plastic sheet, preferably transparent and provided with notes and symbols, to the board. The note board described is operable through the affixed felt and the notes attached thereto as well as through such a foil.

Yet again, the board can be so designed as to be suitable for instructing blind music students. In this case, markers perceivable by the touch are placed on the board surface, so that the note board can be made to sound simply by touching the board surface at the points marked. Where such a board is to be used for the instruction of blind students exclusively, the staff lines and the writing layer can be dispensed with.

In the embodiment shown in Fig. 4, the board 1, which in essentials corresponds to the board described above, presents touch lines 2, which may rise beyond the board surface 3. The degree of rise shown in the drawing is greatly exaggerated. Let into the board below the touch lines 2 or below the spaces are the conductor bars, which are connected to switching means for switching on sound generators. Each touch line 2 is assigned to a particular pitch.

Viewed in the board user's direction of sight A, the touch lines 2 in this embodiment are vertical, and not horizontal as in an embodiment presenting the ordinary staff lines. The vertical position presents important didactic advantages in the instruction of blind people. As blind people cannot read the written notation anyway, an instruction system used for such people exclusively need not conform to the ordinary system.

The degree of rise of the touch lines 2 beyond the board surface 53 should be such that it is sufficient for easy touch detection while not hindering easy sliding over the touch lines.

Instead of having the touch lines 2, it is of course possible to use any other raised marks to mark the points at which the particular conductor bars are located below the board surface.

In a preferred version, the board is made in such a manner that it can be overlaid with thin sheets which can be provided with instruction programs in Braille, for instance. However, the thickness of such a sheet must not exceed a certain limit if the capacitive proximity switches connected to the conductor bars located below the board surface are still to respond with certainty when the sheet surface is touched. In such a case, markers directly placed on to the board surface may be unnecessary, so that a board with a perfectly clear surface may be used. The sheets or matrices can be affixed to the board in a simple manner, as by press fasteners 4. Instead, any other type of fastener, such as interlock fasteners, may be used. Such fasteners keep the sheet in the correct position with respect to the conductor bars and also keep it from being accidentally shifted.

A preferred version of a note board suitable for the placing of magnetic markers consists, viewed in corss-section, of a supporting layer containing impregnated kraft paper (phenolic paper), for instance. Over this is an adhesive surface bearing a layer of sheet iron or a permanently magnetized layer. Over this again is another adhesive layer forming the transition to an insulating layer of impregnated kraft paper. This insulating layer may have a thickness of 50 microns, for instance. Over this is a layer which contains the electrodes and which consists of a copper-coated plastic sheet or an insulating foil coated with conductive varnish, for instance. This sheet or foil may have a total thickness of about 20 to 75 microns, for instance. Over this is another layer of impregnated kraft paper 50 microns thick, for instance, and, if necessary, a writing layer, which is preferably provided with raised staff lines and has a thickness of about 50 microns.

In the manufacture of the board, the aforesaid layers are pressed together in a single operation, resulting in a very strong and hard-wearing board. The distance between the writing surface and the iron or magnetic layer is so small that magnetic or iron markers placed on the surface adhere very well.

In a preferred version, the staff lines are slightly raised above the writing surface, so that they can also be easily identified by touch.

The magnetic or iron markers preferably have the shape of note heads and are also colour-coded for easier identification either of different tone lengths or of different pitches. Instead, it is possible to give the markers other shapes, such as folklore figures, which are especially suitable for children for pedagogic reasons.

Of course, the board may be made entirely of flexible material, so that it can be easily rolled up and carried. As the conductor bars are fixed to a flexible sheet and as the connections may be fixed to the same sheet, for instance, it is convenient to provide the board surface or underside with a plug socket for connection to the other switching means. At least part of these switching means can be accommodated in a case into which the board can be rolled up.

I claim:

1. Sounding note board means for music instruction, comprising a plurality of tone generator means for generating predetermined sound frequencies, a board, a plurality of conductor bars positioned below a surface of the board, switching means operatively connecting said conducting bars and said tone generator means for selective actuation of the latter in accordance with selection of particular ones of said bars by a player, said conductor bars constituting portions of proximity switch means operable by a player touching the board surface at desired locations of a note pattern, whereby touching of said surface by a body portion of a player in the operating vicinity of a conductor bar causes its associated proximity switch means to be actuated causing said switching means to actuate a predetermined portion of said plurality of tone generator means, said board being provided with a writing layer and an iron or magnetic layer arranged at such a distance from the writing surface that attachable magnetic or iron platelets adhere to the writing surface.

2. Note board means as set forth in claim **1**, including an alternating voltage generator, establishing an ambient field that is coupled to the operating vicinity of said tone bars by a body portion of a player.

3. Note board means as set forth in claim **1**, in which the switching means includes a section associated with each of said conductor bars, each of said sections of said switching means including at least one electronic switch connected by a bias circuit to the associated conductor bar in such a manner that the electronic switch is cut off in its idle state and opens when the board surface in the operating vicinity of the associated conductor bar is touched by a body portion of a player.

4. Note board means as set forth in claim **3** in which each of the electronic switches includes means for adjusting the sensitivity thereof.

5. Note board means as set forth in claim **1**, also including an individual plug operatively connected in circuit at a point between each of said proximity switches and its associated tone generator means.

6. Note board means as set forth in claim **1**, in which there are associated with each of said tone generator means half-tone generators which oscillate at a half-step lower and higher, respectively, than the associated tone generator means, and additional switches for selectively switching on said half-tone generators.

7. Note board means as set forth in claim **1**, comprising noise generator means operatively connected to the tone generators and tone generator means which superimposes distortions on normally sinusoidal outputs of said tone generators and tone generator means.

8. Note board according to claim **1**, characterized in that the iron or magnetic layer as viewed from the writing surface is arranged below the conducting bars.

9. Note board means as set forth in claim **1**, in which the board includes layers in the following sequence:

a. writing layer
b. insulating layer
c. layer bearing the conducting bars
d. second insulating layer
e. adhesive layer
f. iron or permanently magnetized layer
g. adhesive layer
h. supporting layer.

10. Note board means as set forth in claim **1**, in which the board is provided with staff lines formed by raised ridges on the surface of the board.

11. Note board means as set forth in claim **1**, in which the attachable platelets are color-coded.

12. Note board means as set forth in claim **1**, in which the attachable platelets are formed as symbolic figures.

13. Note board means as set forth in claim **1**, in which the conductor bars are vertical in the board as viewed by a player, and that there are markers associated with the conductor bars forming protrusions in front of the board surface so as to be detectable by touch by a player feeling over the board surface.

14. Note board means as set forth in claim **1**, in which the board is constructed entirely of flexible material.

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