United States Patent [19]

Del Castillo

[11] **3,765,294**

[45] **Oct. 16, 1973**

[54] **TEACHING DEVICE FOR ATTACHMENT TO A KEYBOARD INSTRUMENT**

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[21] Appl. No.: **267,387**

Related U.S. Application Data

[63] Continuation of Ser. No. 135,601, April 20, 1971, Pat. No. 3,709,085.

[30] **Foreign Application Priority Data**

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June 26, 1970	Mexico	120,374
July 10, 1970	Mexico	120,687
Aug. 3, 1970	Mexico	121258

[52] **U.S. Cl.** **84/166**

[51] **Int. Cl.** **G10f 5/04**

[58] **Field of Search** 84/147, 161, 166

[56] **References Cited**

UNITED STATES PATENTS

697,327	4/1902	Crooks	84/166
1,187,697	6/1916	Austin	84/147
1,107,558	8/1914	Turney	84/166
593,165	11/1897	Sanders	84/161 X

Primary Examiner—Richard B. Wilkinson
Assistant Examiner—Lawrence R. Franklin
Attorney—Karl W. Flocks

[57] **ABSTRACT**

A device non-integral with the keyboard instrument with which it is used is activated through sheet, card or substitute keyboard means to activate in turn indicating heads mounted over the keyboard of an organ, piano or similar instrument and which designate the keys to be played by lighting or solenoid controlled means. The control sheet or card may utilize raised, indented, or apertured sheets or cards detected through various type contact or photocell means which feed the signal through an elelctronic relay to the indicating means.

1 Claim, 17 Drawing Figures

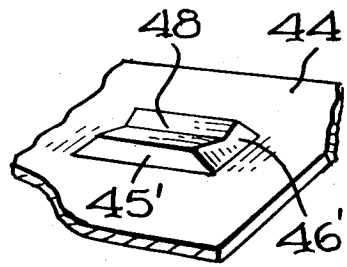
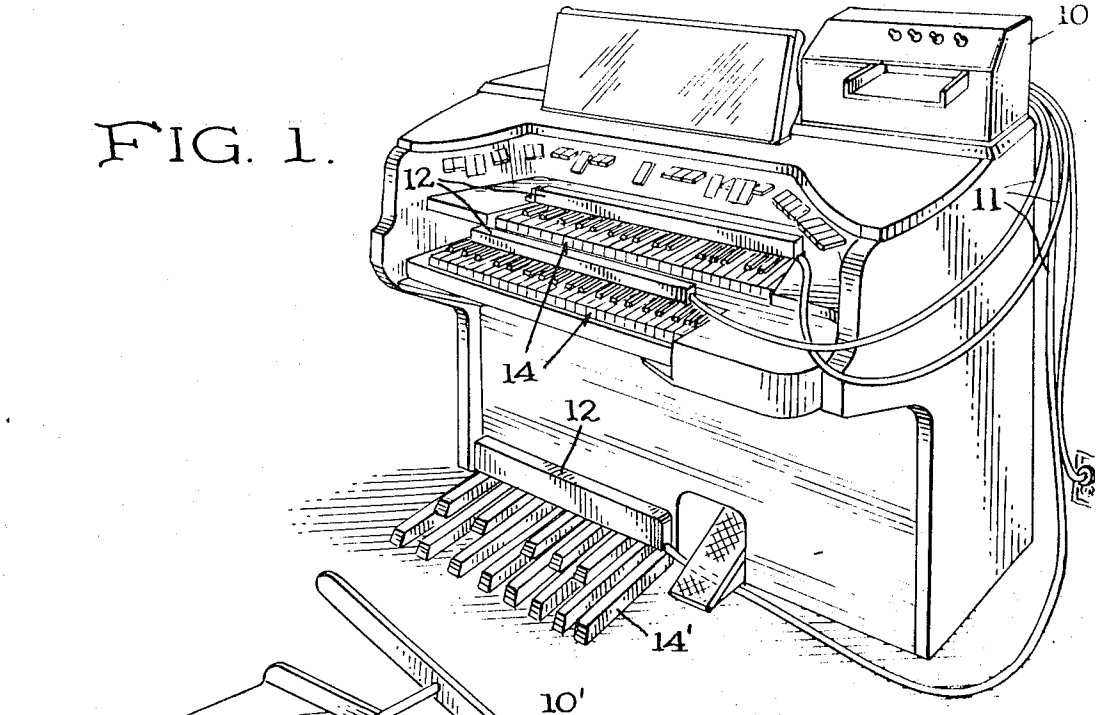


FIG. 1.



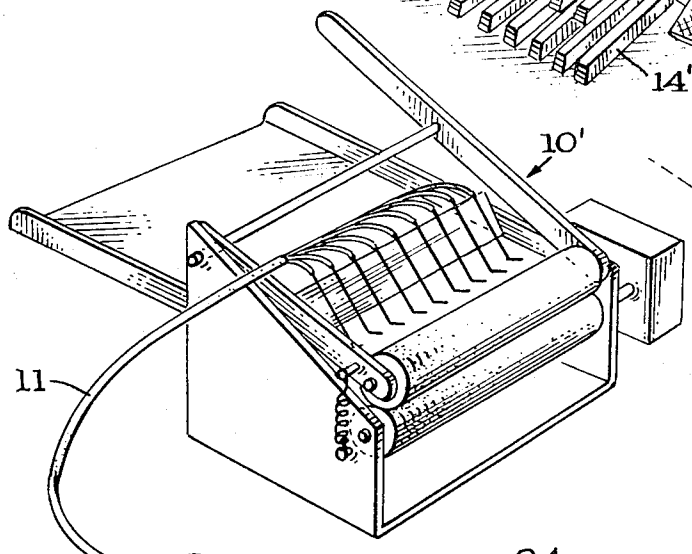


FIG. 1A.

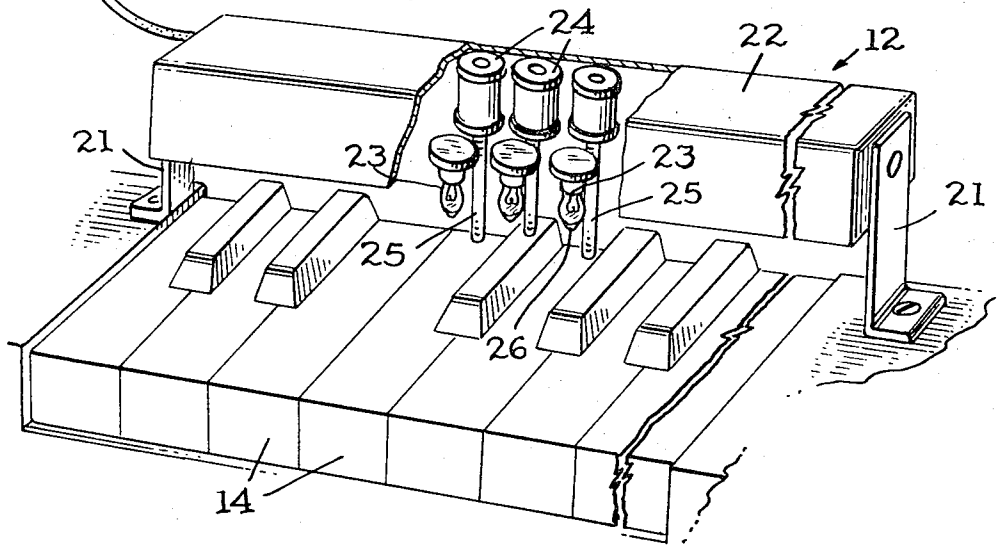


FIG. 2.

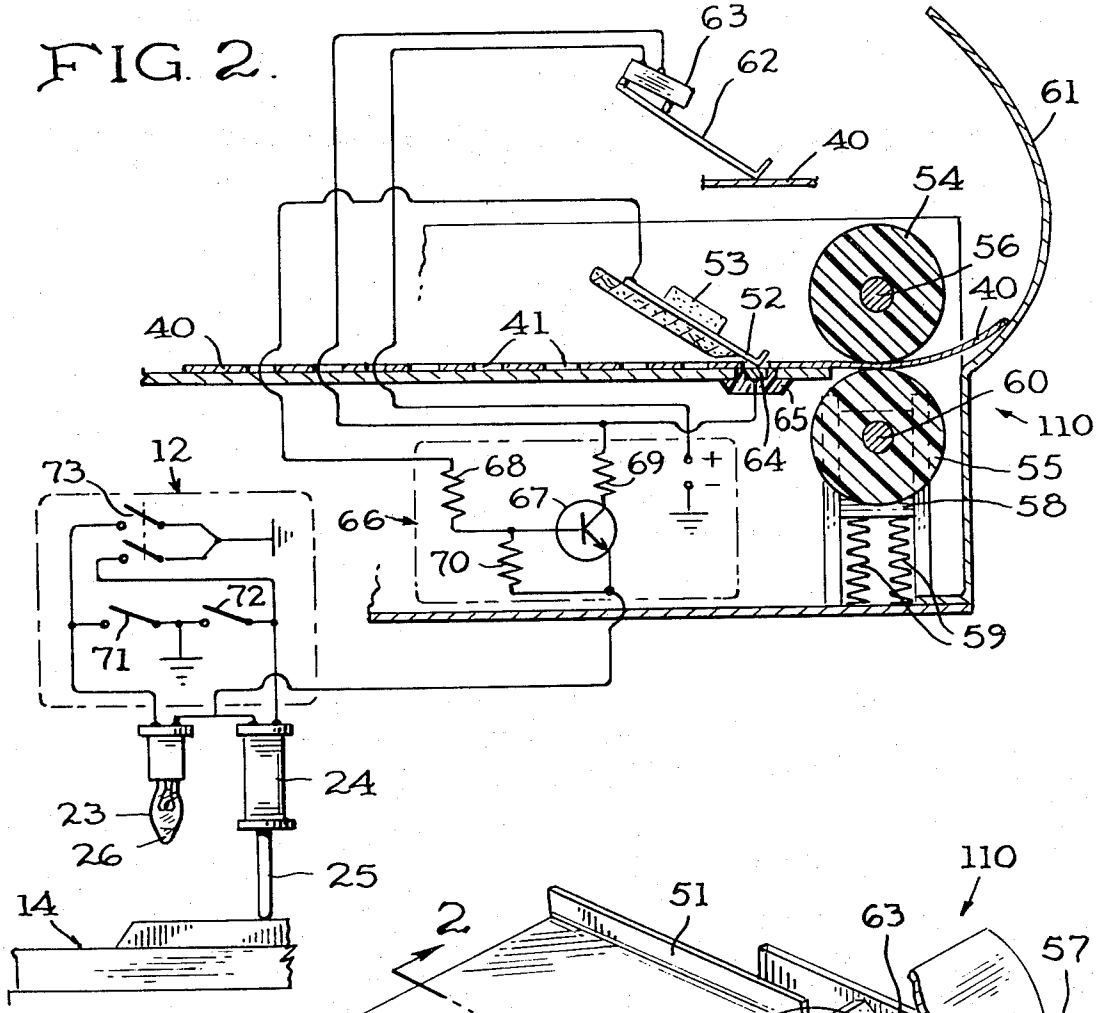

63
62
61
40
54
56
53
52
40
41
40
60
110
65
64
55
58
12
73
68
69
+
67
66
70
72
71
59
24
23
26
25
14

FIG. 3.

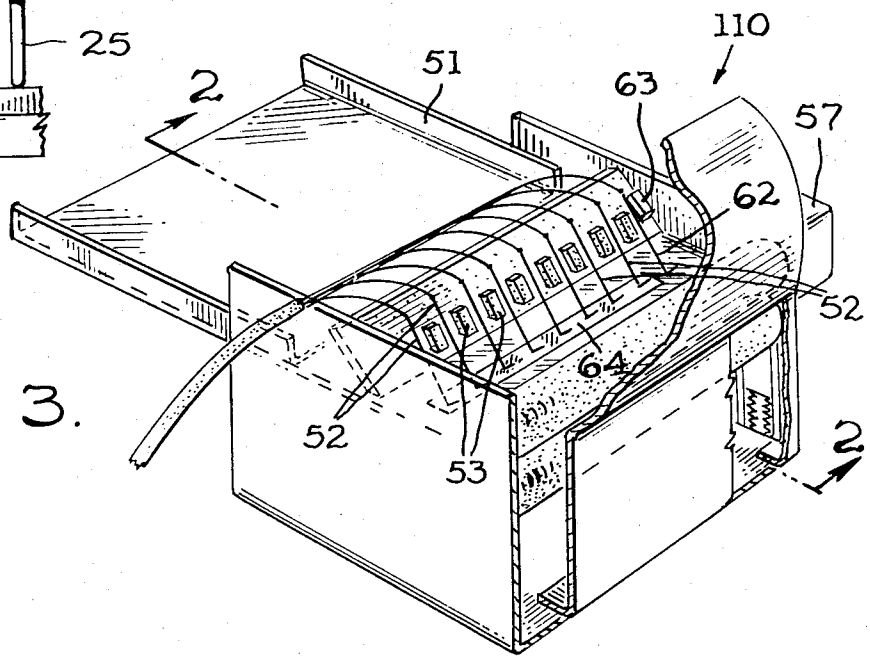

110
51
63
57
2
62
52
64
52
53
2

FIG. 4.

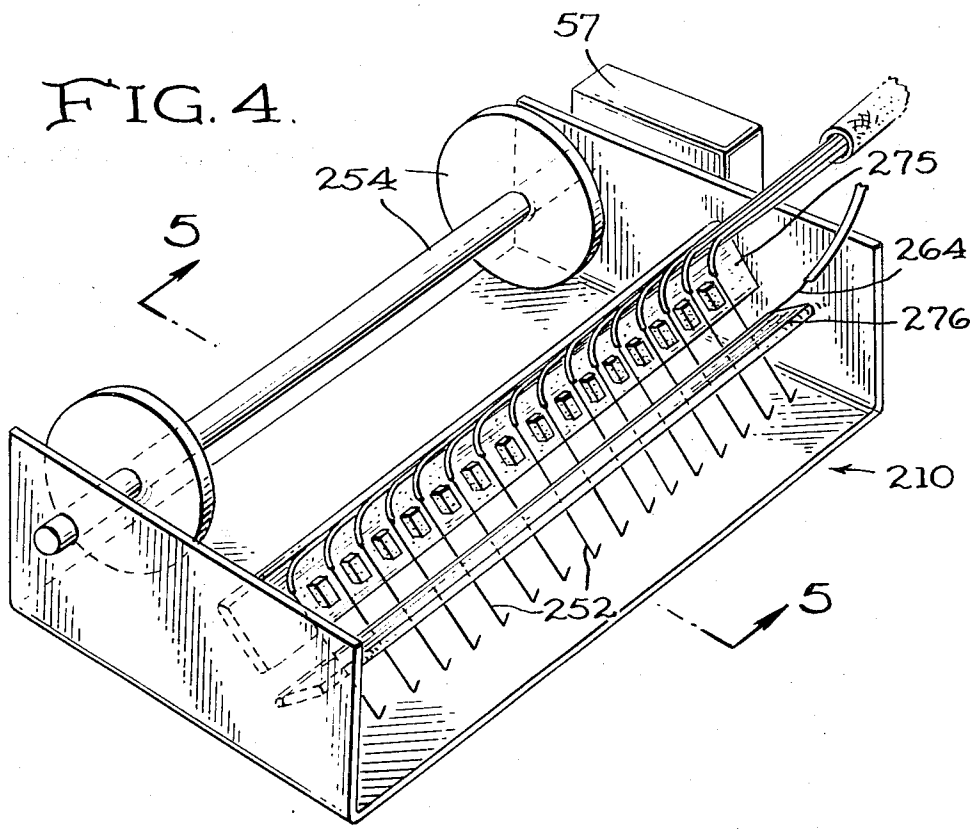

57
254
275
264
276
5
5
210
252

FIG. 5.

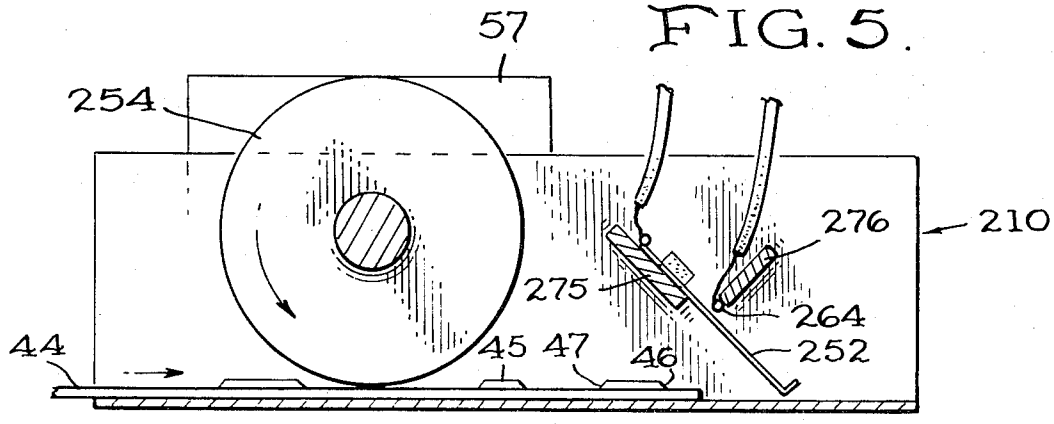
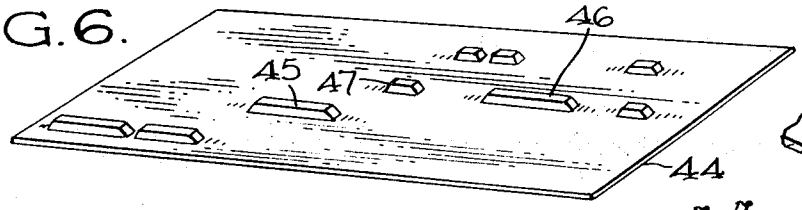

57
254
276
210
275
264
252
44
45
47
46

FIG. 6.



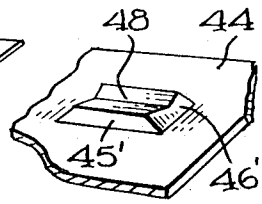


FIG. 6A.

FIG. 7.

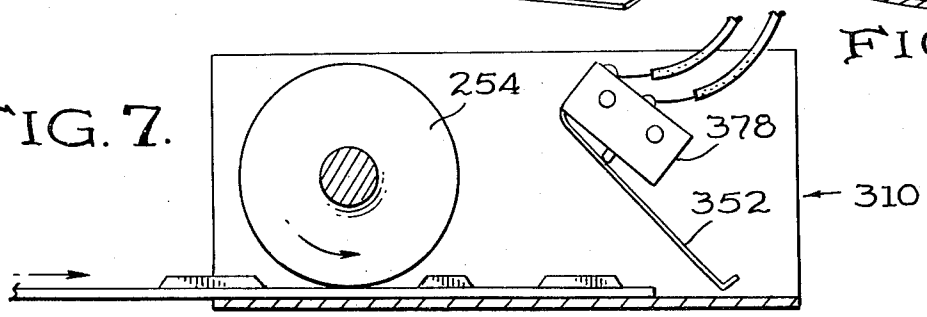


FIG. 9.

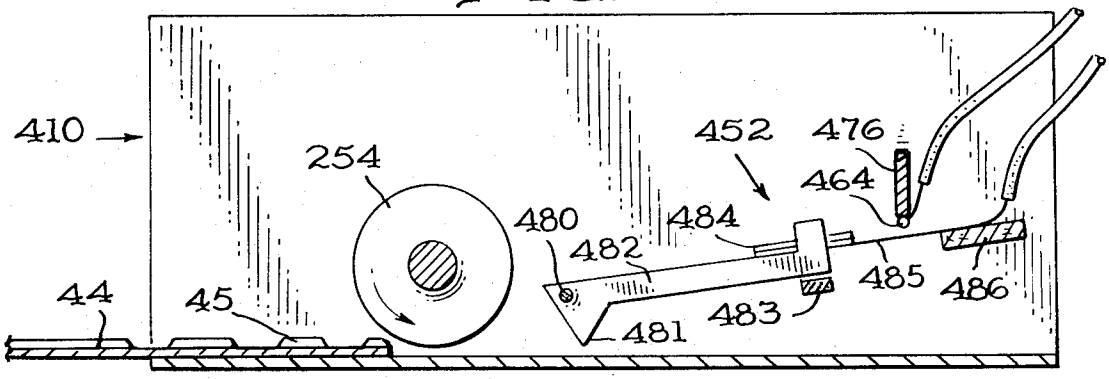


FIG. 8.

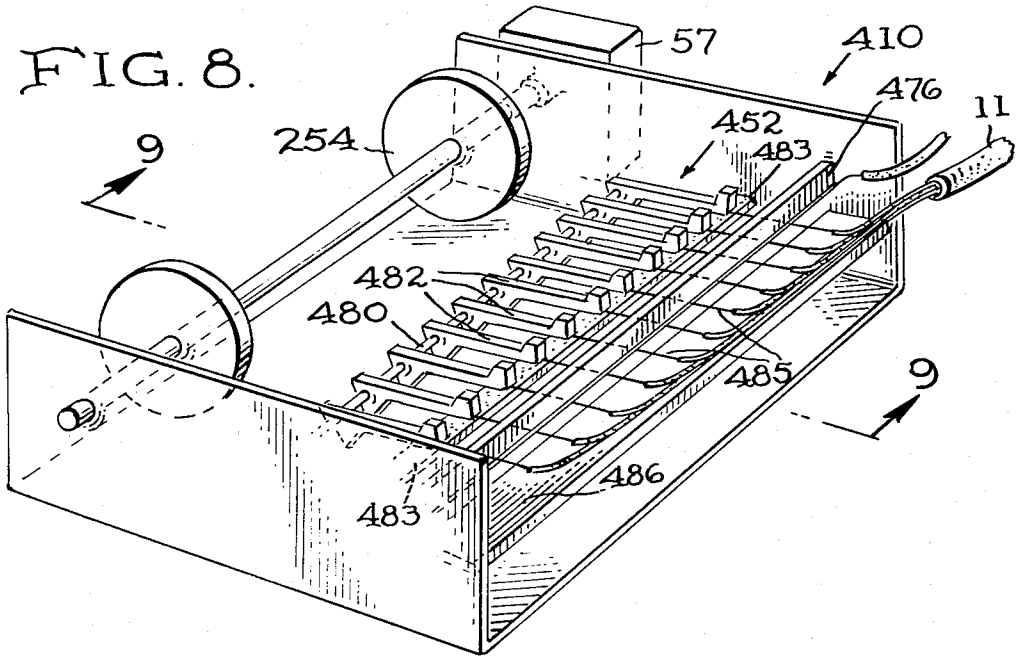


FIG. 10

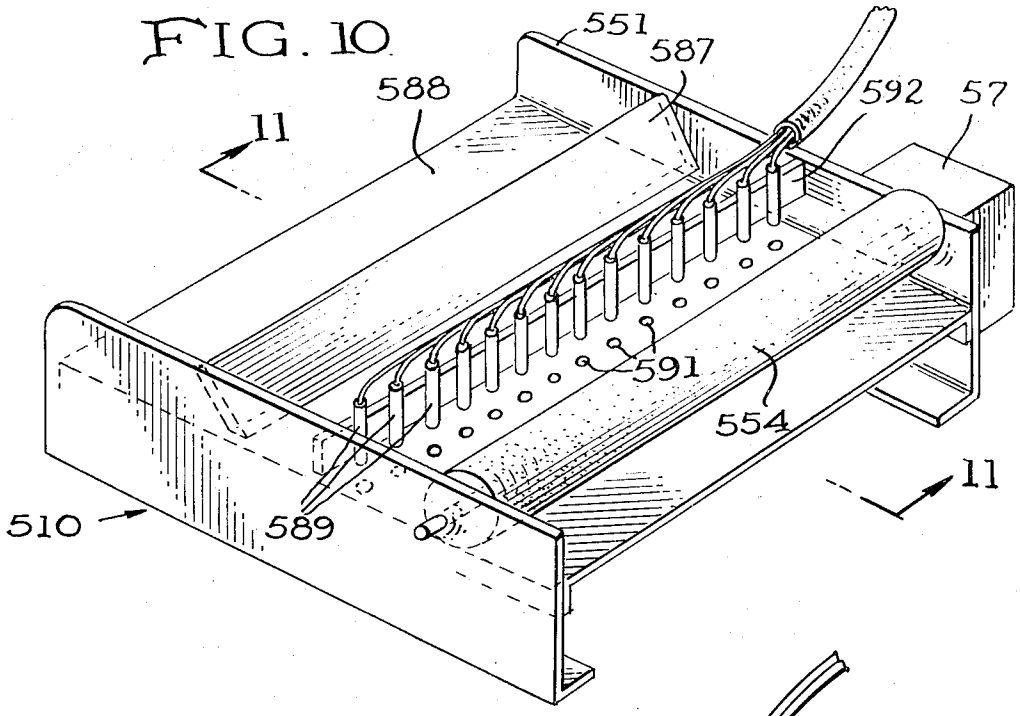
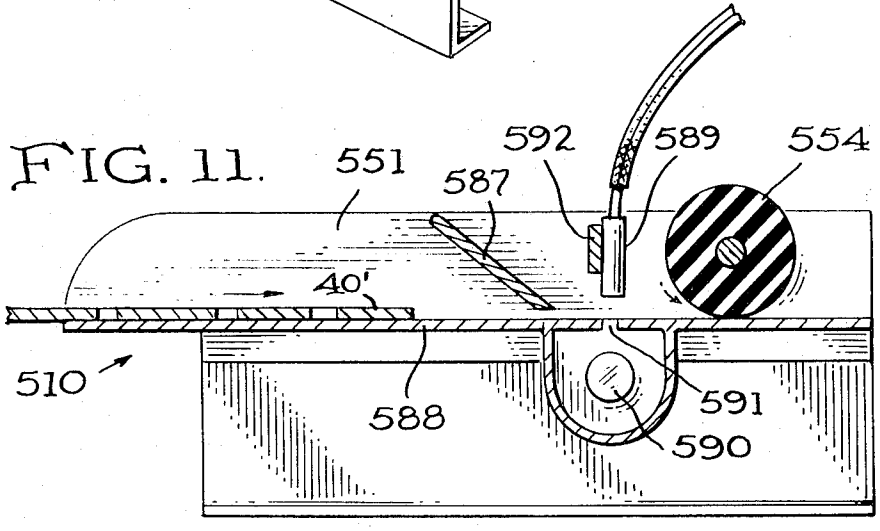


FIG. 11.



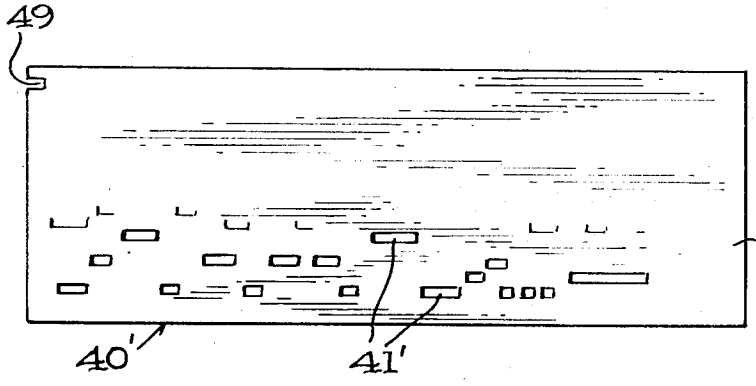


FIG. 12.

FIG. 13.

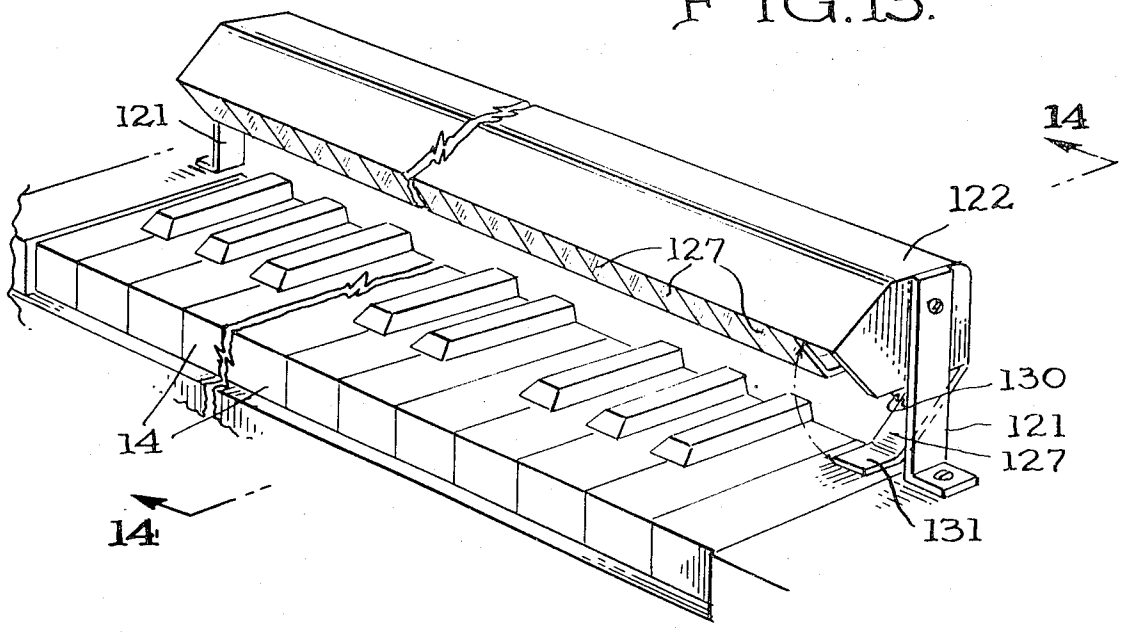


FIG. 14.

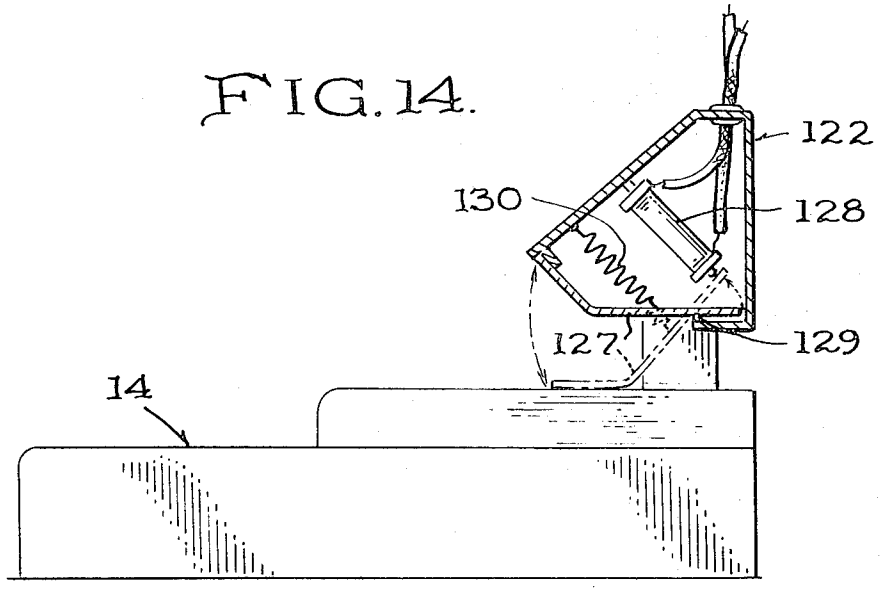
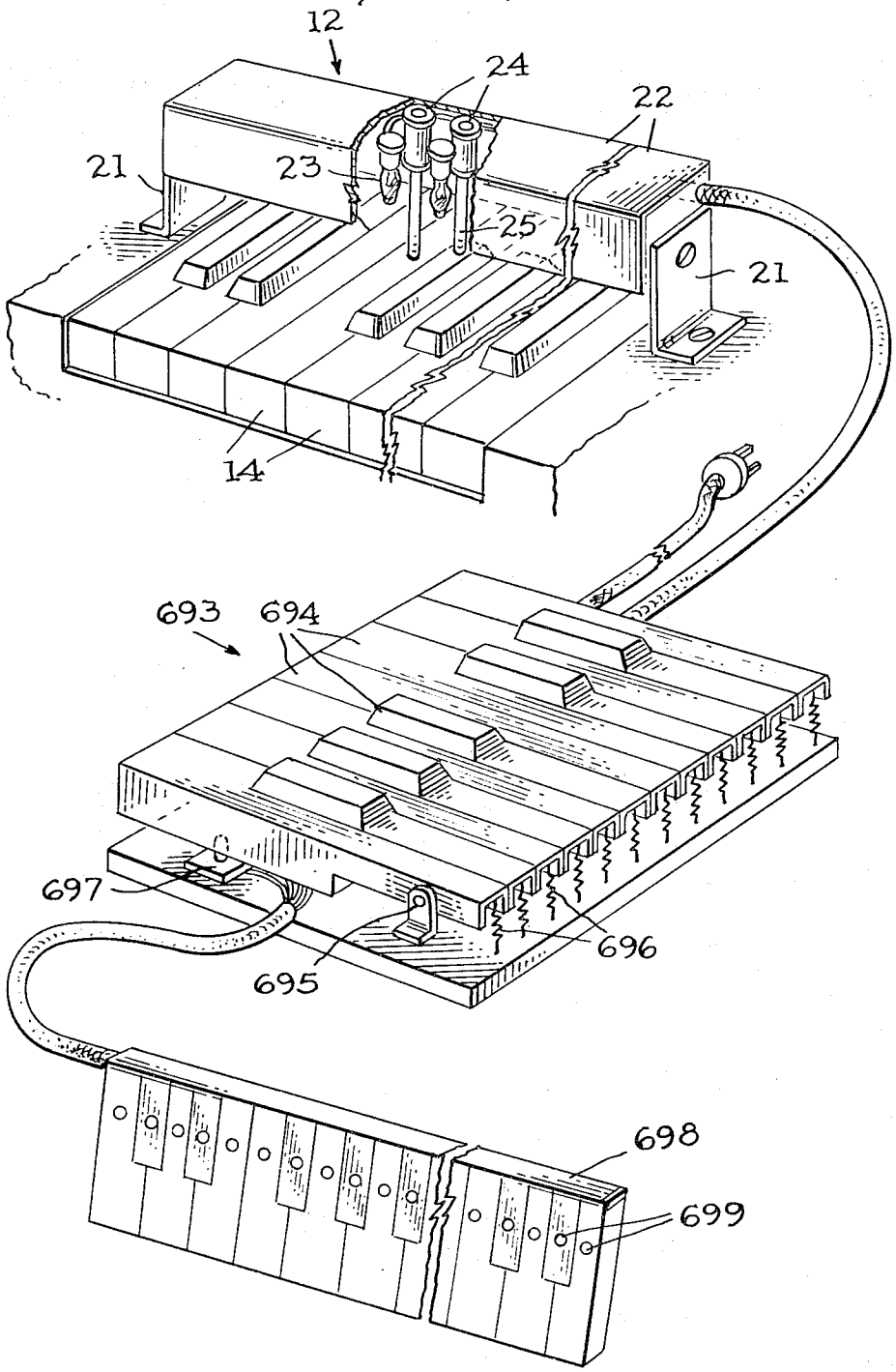


FIG. 15.



TEACHING DEVICE FOR ATTACHMENT TO A KEYBOARD INSTRUMENT

This is a continuation, of application Ser. No. 135,601, filed Apr. 20, 1971 now U.S. Pat. No. 3,709,085.

BACKGROUND OF THE INVENTION

The present invention refers to a teaching device to facilitate learning to play melodies on any keyboard driven musical instrument and in particular it refers to such a teaching device which may be easily mounted on such a keyboard instrument without any alterations to the internal portions of the musical instrument if it is not desirable to make such alternations. A selected musical score used in the device will activate light and/or solenoids to designate the keys as they are to be played thereby allowing a pupil to play the music by following the lights or alternatively to listen to the music being played while noting the keys which are being used to play this music.

The prior art has disclosed teaching devices with light designated keys in accordance with some control record sheet or card and also has disclosed means of playing a keyboard instrument automatically through such means coupled with solenoid or similar means. But in all cases in the prior art, the means to accomplish this has been structure which requires extensive alterations to the keyboard instrument or must necessarily have been built into the instrument at the time of manufacture.

SUMMARY OF THE INVENTION

It is an object of the present invention to provide a teaching device which may be controlled so as to indicate the keys in order and in proper time relation to each other which are to be played on a keyboard musical instrument to allow a pupil to play music thereon.

It is a further object of the present invention that such teaching device be easily mountable upon the keyboard musical instrument without any disturbance to the internal portions of the musical instrument, and, in effect, be made so as to be easily portable and used without change between several similar type keyboard musical instruments.

It is a further object of the present invention to designate the proper keys to be played by optical means and to allow the simultaneous playing of these keys automatically when such combination use is desired.

It is a still further object of the present invention that the control of such indicating means be through use of a record sheet or card having either raised portions, indented portions, or transparent windows or apertures therethrough.

Another object of the present invention is that the control means be a simulated keyboard operated by a teacher to control the indicating means which will allow a pupil to follow the teacher in the operation of the proper keys on the keyboard.

Basically, the present invention utilizes a control means which is either a reading head or a simulated keyboard which sends electrical signals to indicating heads mounted over a keyboard or keyboards to light specific keys and manipulate these keys where desired in accordance with the music to be played on said musical instrument.

BRIEF DESCRIPTION OF THE DRAWING

The above, as well as further objects and advantages which are inherent in the invention, will become apparent from the following description, reference being had to the accompanying drawings wherein:

FIG. 1 is a perspective view of the device of the present invention mounted for operation on an organ;

FIG. 1A is an enlarged perspective diagrammatic view of a reading head without its cover and an enlarged showing of the indicating head with a broken away portion showing details of mounting said indicating head;

FIG. 2 is a combination wiring diagram schematic in diagrammatic view of one embodiment of an overall system of the present invention;

FIG. 3 is a perspective view with broken away portions of a reading head having the embodiment of the reading device portion of FIG. 2;

FIG. 4 is a perspective view of a second embodiment of a reading head utilizing a different form of control sheet;

FIG. 5 is a vertical sectional view of the reading head of FIG. 4 taken along line 5 — 5;

FIG. 6 is a perspective view of a form of the record sheet or card used with the reading head of FIGS. 4 and 5 and also with other embodiments described below;

FIG. 6A is an enlarged fragmentary perspective view of a portion of a modified record sheet or card;

FIG. 7 is a vertical sectional view of another embodiment of a reading head of the presnt invention which is a variation of that shown in FIGS. 4 and 5 and which may also be used with the record sheet or card of FIG. 6;

FIG. 8 is a perspective view of a third embodiment of a reading head of the present invention;

FIG. 9 is a vertical sectional view of the reading head of FIG. 8 taken along line 9 — 9;

FIG. 10 is a perspective view of a fourth embodiment of a reading head of the present invention;

FIG. 11 is a vertical sectional view of the reading head of FIG. 10 taken along line 11 — 11;

FIG. 12 is a sheet or card form for use with the reading head shown in FIGS. 10 and 11;

FIG. 13 is a perspective view of another embodiment of an indicating head that can be used with the apparatus of FIG. 1;

FIG. 14 is a vertical sectional view of FIG. 13 taken along line 14 — 14; and

FIG. 15 is a perspective view of the teaching device of the present invention with a different control means utilizing a teacher's keyboard to control an indicating head as in FIGS. 1 and 2.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring first to FIG. 1, there is shown a form of the teaching device of the present invention mounted for use with an organ. A reading head 10 which need not occupy too much space is placed on a convenient surface such as the top of the organ or, alternatively, it may be placed on a small table beside the organ. Such positioning is merely for the convenience of one who will feed the record sheet or card to the reading head 10. Attached by cables 11 to the reading head 10 are indicating heads 12 which may be attached to the musical instrument over the keyboards 14 or may be merely

stood over the keyboards 14 on their legs 21 which support the housing 22 of the indicating heads 12 over the keyboards 14 of the organ. In each of the housings 22 there are mounted a plurality of bulbs 23 and solenoids 24 electrically connected to the cable 11 from the reading head 10. As can be noted in FIG. 1, the organ shown therein has two sets of keys 14 and a set of foot pedals 14' each of which has an indicating head 12 standing over it. The number of indicating heads 12 can, of course, be adapted to conform to the keyboard instrument being used since in the case of a piano there being only one set of keys 14, only one indicating head 12 may be necessary, and since the foot pedals do not control as much of the musical instrument as in the organ, no indicating head 12 may be necessary for use with the foot pedals of the piano.

As can be seen, no actual attachment of any portion of the teaching device is necessary to the organ and this device may be easily transferred from one musical instrument to another of the same type without difficulty or alternations to the musical instrument. It is optional whether the indicating heads merely stand on their legs 21 over the keyboards 14, 14' or whether a screw attachment to the piano surface is made.

As shown in the detail view in FIG. 1A, in each of the housings 22 of indicating heads 12 there is located a plurality of solenoids 24, each having a plunger 25 which contacts a key of keyboard 14. Also mounted in the housing 22 are a plurality of light bulbs 23 with each of the bulbs having a lens portion 26 in its tip which allows a concentration of the light on the particular key being designated to be played.

In FIG. 2 there is shown a diagrammatic view of the device of FIG. 1 with one of the embodiments of a reading head 110 used with the present invention shown therein. This embodiment of the reading head 110 is shown in a perspective view in FIG. 3.

A record sheet 40 is fed in through the guide 51 past the plurality of contacts 52 which are arranged transversely of the guide 51 and record sheet 40 and are separated by insulated separators 53 to prevent lateral movement of the contact 52. The record sheet 40 is fed into the rollers 54, 55 wherein the upper roller 54 is connected through its axle 56 to a constant speed motor 57 and the idler roller 55 below it is mounted in a support 58 on a compression spring or springs 59 which supports the holder 58 for the axle 60 for the idler roller 55. The record sheet 40 is then continued in its travel against the curved surface of the back 61 of the reading head 110 and curves back and out of the reading head. An additional contact 62 shown is connected to a microswitch 63 and positioned for alignment with notch 49 (FIG. 12) so that immediately before the passage of the end of the record sheet 40 the current through the contacts 52 is shut off to prevent the possibility of too much current through all contacts 52 making contact with the conducting surface 64 mounted on an insulated base 65 and thereby burning out the equipment. The record sheet 40 which in the present case is shown as having apertures 41 therethrough passes beneath the contacts 52 and when an aperture 41 passes beneath the contact 52, the contact 52 is allowed to drop into the space 41 therein in the card or sheet 40 and contact the conducting surface 64. This closes the circuit wherein current is passed through the electronic relay 66 with the transistor 67 and resistors 68–70 in theconfiguration shown so as to pass current to the indicating head or heads 12. Depending upon which contact 52 closes, the circuit to the connecting solenoid 24 or light bulb 23 is activated. The switches 71–73 shown in the housing, which of course are merely shown there for convenience, and may be mounted in any convenient place, determine whether it is to be used to show the key designated (switch 71) or whether a plunger on the respective solenoid will be activated (switch 72) through the switching arrangement shown. Either or both (switch 73) may be activated. The bulbs 23 preferably each have a lens portion 26 in their tip which allows a concentration of the light on the particular key designated. Instead of using such a special bulb, it is possible to include a housing for each bulb having a lens portion in its tip which will operate in a like manner to the bulb shown. The constant speed motor 57 which operates in the reading head 110 so as to move the record sheet 40 through at a properly designated timing for the music being played may be made to operate at variable speeds for setting in accordance with the proper tempo of the music being played. A simple rheostat arrangement will accomplish this but is not shown in the drawings.

A second embodiment in a reading head which may be used in this device of the present invention is reading head 210 shown in the perspective view of FIG. 4 and the vertical sectional view of FIG. 5. The electrical connections between the units are the same but in this case a twin wheel roller 254 to move the record sheet or card 44 is used as shown, with this roller 254 being drive by a constant speed motor 57. The roller 254 could also be effective with a single or more than two wheels. The record sheet 44 utilized in this embodiment has raised portions 45 thereon and is of the type shown in FIG. 6. As the roller feeds record sheet 44 past the contact 252, the contact 252 is raised upon being pushed up by a raised portion 45 on the sheet 44 and makes contact with a common conductor 264 thereby closing the circuit so that the circuit from that individual contact 252 is closed to a designated lamp 23 or solenoid 24 in the indicating head 12 as in the case with the previous embodiment. Insulated supports 275 and 276 shown merely limit the downward and upward movement of the contact 252 respectively, with the upward motion limited through the positioning of the common conductor 264 thereabove and lateral movements limited by insulated separators shown similarly to insulated separators 53 in a previous embodiment.

It has been found that when the raised portions 45 are utilized on the record sheet or card 44, the apparatus will work in a much better manner with sloped forward edges 46 and sloped rear edges 47 on raised portions 45. Alternatively as shown in FIG. 6A the sheet or card 44 may have a raised portion 45' with a channel or groove 48 in its top surface and cut from sloping surface 46', as shown in order to help guide contact 252. In utilizing such raised portions a mold may be made up for a particular musical pattern and this mold may be used to stamp out record sheets or cards 44 in large quantities very inexpensively and with more accuracy and speed than might be found in some punching operations when utilizing an apertured card or sheet 40. It has also been found that the raised portions 45 tend to endure in some cases due to the material used in making these record sheets 44 as well as in some cases better than the aperture cards 40.

A third embodiment of the reading head which will utilize the record sheet **44** shown in FIG. **6** is reading head **310** shown in FIG. **7.** This variation of the reading head previously discussed in connection with FIGS. **4** and **5** also utilizes a twin wheeled roller **254,** although a single wheeled roller or one having additional wheels can be used, operated by a constant speed motor to advance the record sheet or card **44,** with the raised portion **45** thereon, past the row of contacts. But in this case each of the contacts **352** has its own individual microswitch **378** and upon the operation of contact **352** by a raised portion **45,** the circuit which is closed by that microswitch **378** operates in the manner previously described to operate a light **23** or solenoid **24** in the indicating head **12.**

A fourth embodiment of a reading head which may be operated within the wiring as described in FIG. **2** is reading head **410** shown in the perspective view and vertical sectional views of FIGS. **8** and **9,** respectively. Again a twin wheeled roller **254** operated by a constant speed motor **57** is shown to be used to feed the card or sheet **44** to the contacts **452.** Also, as mentioned with some previous embodiments, the card or record sheet **44** of FIG. **6** is used having raised portions **45** to operate the contacts **452.** The contacts **452** in this case are mounted so as to have a common pivot rod **480** through all of the contacts **452** situated transversely of the moving record sheet **44** and a feeler point **481** below and just past the pivot rod **480** connected to an arm **482** which rests on a support member **483.** On the opposite end of arm **482** from feeler point **481** and pivot rod **480** there is an insulated member **484** with a contact finger **485** attached thereto connected to the cable **11** and having its opposite end from the insulated member **484** resting upon a contact limit support **486.** Above this contact finger is located a support **476** having a common wire **464** attached thereto. In operation, the record sheet or card **44** is advanced by the roller **254** toward and beneath the feeler point **481** which upon encountering the raised portion **45** is thereby raised, causing the arm **482** to pivot about the pivot rod **480,** thereby raising the opposite end of the arm from the feeler point **481,** raising the insulated member **484** and thereby raising the contact finger **485** into contact with the common wire **464,** and closing the circuit which may be similar to that shown in FIG. **2.** The solenoid **24** or lamp **23** associated with that contact finger **485** is then operated.

A fifth embodiment of a reading head for the present invention is reading head **510** shown in perspective and vertical sectional view in FIGS. **10** and **11,** respectively. This form of the reading head operates with a record sheet or card **40'** of the type shown in FIG. **12** having apertures of transparent windows **41'** through an opaque surface **42.** The record sheet or card **40'** is fed along guide **551** and between guide **587** and guide base **588.** The record sheet **40'** then passes between the photocell **589** and the lamp **590** over the aperture **591.** With this embodiment, whenever an opening **41'** in the card or sheet **40'** coincides with the aperture **591,** the light from the lamp **590** is detected by the photocell **589** mounted on support **592** and the circuit to the appropriate electronic relay **66** and its indicating lamp **23** or solenoid **24** is closed. In a manner similar to a previous embodiment, the roller **554** driven by a constant speed motor **57** moves the record sheet **40'** in timed relation to the notes thereon whereby the music may be played with the proper tempo.

A different embodiment of indicating heads from that previously described may be used as shown by indicating head **112** in FIGS. **13** and **14.** In this embodiment an arm **127** drops down onto the key and thereby designates the key to be pushed instead of through use of a lamp as in the previous embodiment. The solenoid **128** which has been connected in a manner shown in FIG. **2** is controlled by a contact **52** in the reading head **110** and upon the circuit being closed by the particular contact **52** connected to that solenoid **128,** the arm **127** has its back portion drawn to the solenoid **128,** thereby causing the arm **127** to pivot on the hinge **129** attached to the arm **127** and to the housing **122** and to drop down onto the key against the force of the compression spring **130** attached between the housing **122** and the arm **127.** It is possible that some distinctive color may be used on the horizontal portion **131** so that the key to be pressed is clearly brought to the attention of the pupil. Upon opening up the circuit to the solenoid **128** the spring **130** returns the arm **127** into a raised position into the bottom of the housing **122.** As with the previous embodiment the housing **122** is mounted on legs **121** which allow it to be placed in a position over the keyboard **14** without any alteration to the keyboard instrument whether it be an organ or a piano or similar type musical instrument.

in some cases instead of utilizing a reading head as the control means for the indicating head, it has been found preferable when a teacher is available to allow the teacher to operate the control means. In such case a teacher's keyboard **693** is connected to indicating means **12** as is shown in FIG. **15.** In this case the teacher's keyboard **693** is composed of keys **694** similar in number and position to those found on the musical instrument being taught. Each of the keys is pivoted at a point **695** with a spring **696** to return it to its normal position of rest after being pressed and released. A microswitch or some sort of push-button switch **697** located below each key **694** is wired so as to operate by closing the circuit to the lamp **23** or solenoid **24** over the similarly placed key on the keyboard **14** of the piano or organ of the pupil. At the same time, either in order to allow the pupil to find the proper keys without looking at the musical instrument keyboard, or in order to allow the instruction to be conducted for more than one pupil, a keyboard panel **698** is also connected so as to have a light **699** operated on the proper key in accordance with the key **694** pressed down on the teacher's keyboard **693** and the switch **697** operated therebeneath. This control means and indicating means should be as portable and interchangeable among similar type musical instruments as the forms previously described and may be used in a similar manner for teaching a pupil.

It will be obvious to those skilled in the art that various changes may be made without departing from the scope of the invention, such as the variations in the reading head of FIG. **1A** which is not described in detail. Therefore the invention is not to be considered limited to what is shown in the drawings and described in the specification.

I claim:

1. A record sheet means for use with a plurality of contact means, said sheet means moving relatively to said contact means in a predetermined direction,

a plurality of raised contact surfaces on said sheet means for co-acting with said contact means to activate said contact means,

each of said raised contact surfaces comprising a pair of raised portions having a v-shaped groove between them extending in said predetermined direction, the bottom portion of said groove raised above the surface of the sheet means, and each of said contact surfaces having beveled downwardly and outwardly sloping sides at the ends of the v-shaped groove.

* * * * *