

Jan. 14, 1969

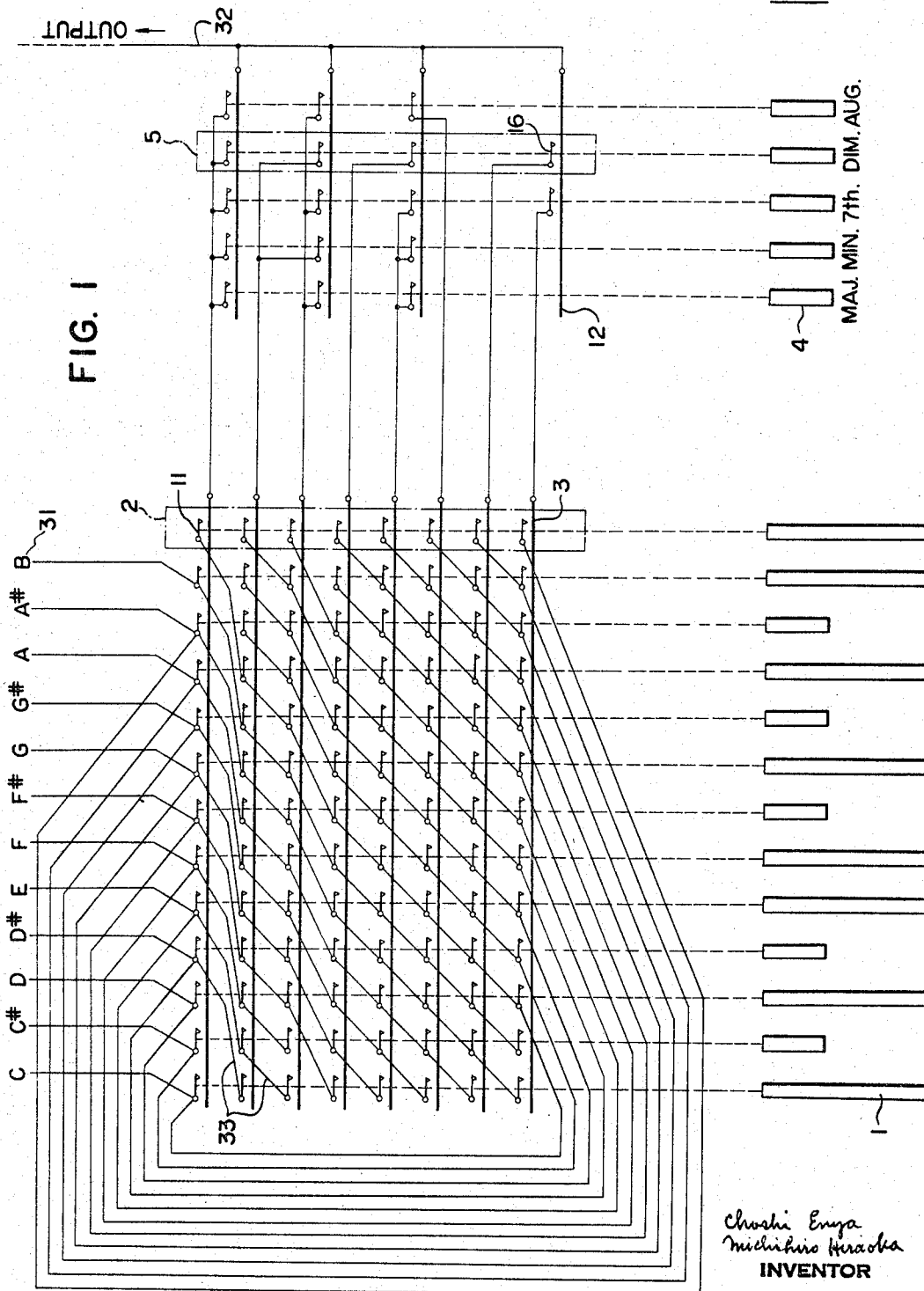
CHOSHI ENYA ETAL

3,422,210

CHORD SELECTING DEVICE IN ELECTRONIC ORGANS

Filed June 24, 1965

Sheet 1 of 4



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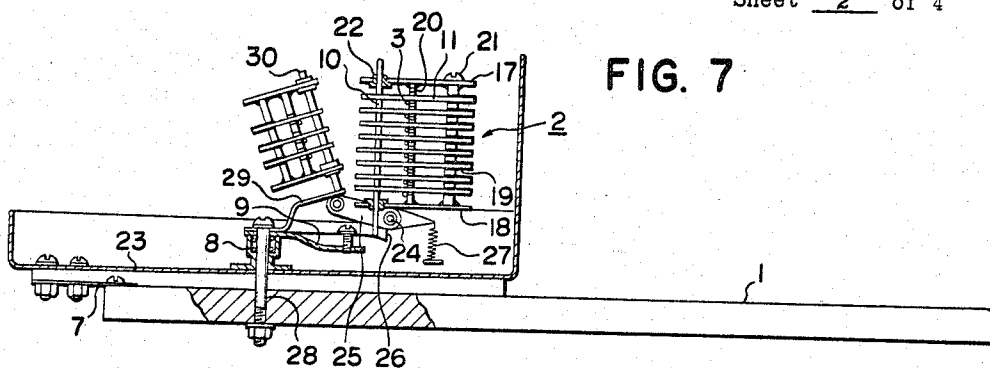


FIG. 7

FIG. 2

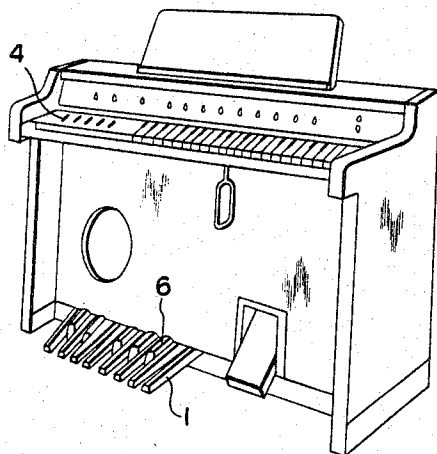


FIG. 4

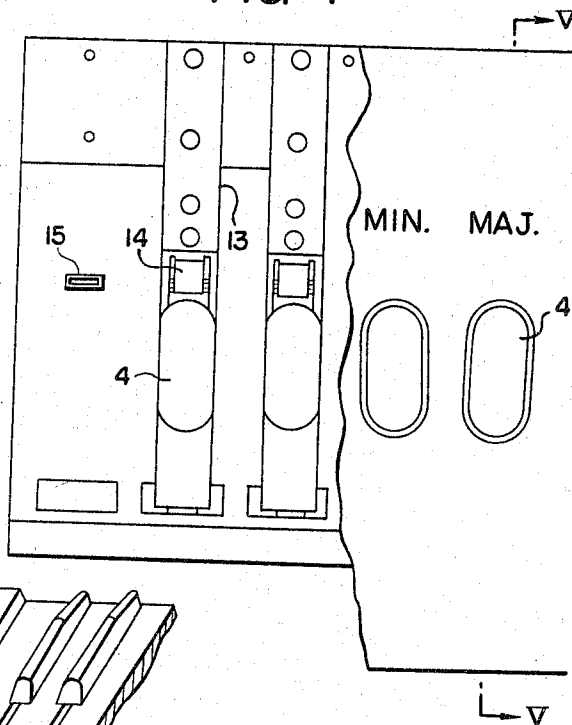
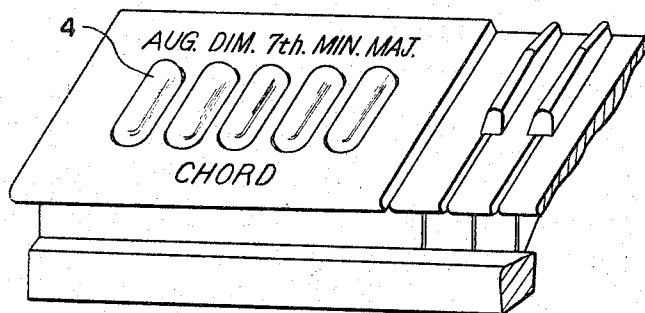


FIG. 3



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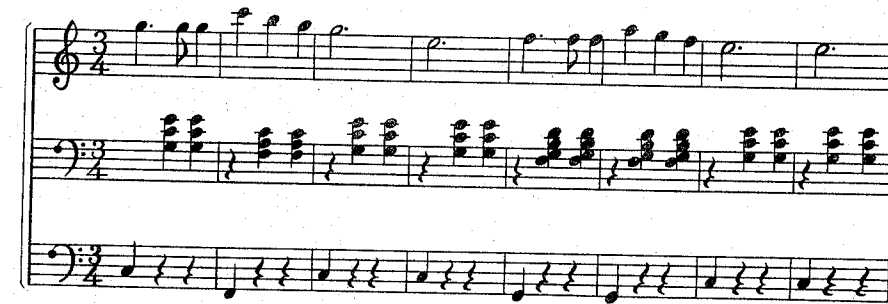
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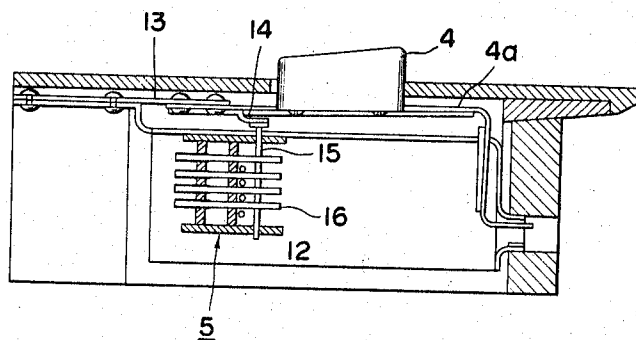
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FIG. 8



(Chord) / MM / MM / MM / MM / 7th 7th / 7th 7th / MM / MM
(Bass) C / / F / / C / / G / / G / / C / / C / /

FIG. 5



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3,422,210
CHORD SELECTING DEVICE IN ELECTRONIC
ORGANS

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Continuation-in-part of application Ser. No. 223,147,
Sept. 12, 1962, which is a continuation-in-part of ap-
plication Ser. No. 54,134, Sept. 6, 1960. This applica-
tion June 24, 1965, Ser. No. 466,695

Claims priority, application Japan, Dec. 24, 1959,
34/40,104

U.S. Cl. 84-1.24 3 Claims
Int. Cl. G10h 1/02; G10h 3/06

ABSTRACT OF THE DISCLOSURE

A chord electronic organ has two kinds of selector means in the chord section of the organ: a chord key selector and a chord type selector, the former being foot operated pedals and the latter being finger operated buttons. Any particular chord is selected both by the key selector and the type selector in combination. When the pedal of G and the button of 7th are pressed, the tones of G, B, D and F come out to constitute the chord of G₇. When a pedal is pressed, the bass tone of that pedal comes out only while the pedal is kept pressed, but the chord key is kept selected even after the pedal is released until another pedal is next pressed down.

This application is a continuation-in-part of prior application Ser. No. 223,147 filed on Sept. 12, 1962, in the name of Choshi Enya and Michihiro Hiraoka, and entitled "Chord Composing Apparatus for Electric Organs," which is a continuation-in-part of application Ser. No. 54,134, Sept. 6, 1960.

This invention relates to a chord electronic organ and more particularly to a chord selecting device in the chord section of the chord electronic organ. A chord organ is generally composed of three sections: a melody or solo section, a chord or accompaniment section and a bass or pedal section. A chord electronic organ of this invention has a melody section and a bass section which are of the construction as in the conventional chord electronic organ, but an improved chord section with a chord selecting device comprising in combination; eight natural pedals; and five sharp pedals which are positioned in the order of the musical scale and have a switch mechanism having eight contacts and five chord buttons each of which has a switch device having three or four contacts. They are the major, minor, 7th, diminished, and augmented chord buttons comprising, respectively, three, three, four, four and three contacts. The device is operated by suitably combined actuation of said pedal contacts and said chord buttons; all as more fully hereinafter set forth and as claimed. This case is a continuation-in-part application of our copending application, Ser. No. 223,147, filed on Sept. 12, 1962. In this prior application the same process is disclosed and claimed, but the present application presents an amplified disclosure of modifications which can be employed.

Heretofore, the conventional chord selecting device has had a large number of chord buttons corresponding respectively to plural chords. Since these chord buttons have been situated independently of one another, it has been difficult to select a certain particular button from among so many chord buttons during the playing of the organ, thus requiring an extreme dexterity in the musical performances. Such manipulations have required a special and additional skill on the part of the musician.

It is an essential object of this invention, therefore, to provide a chord selecting device, in which any chord may be played, in a simple manner, at will from a large number of chords without the need of any special skill for chord selection on the part of the player.

The manner in which the foregoing as well as other objects and advantages may best be achieved will be understood more fully from a consideration of the following description of one embodiment of the invention, taken in conjunction with the accompanying illustrations, in which:

FIG. 1 is a schematic wiring diagram of a cord tone selecting section of an electronic organ according to this invention;

FIG. 2 is a perspective view of an electronic organ according to this invention, in which a cord button keyboard and pedal clavier are schematically shown;

FIG. 3 is a perspective view of a part of the console of the organ according to this invention, in which the chord button keyboard including chord type indication is provided;

FIG. 4 is a plan view of the chord button keyboard, a part thereof being broken away, showing the details of the construction of the chord button switches;

FIG. 5 is a fragmentary, vertical, sectional view of an organ section chord button and chord button switch taken along the line V—V of FIG. 4, showing the details of the essential parts and construction of the chord button switches;

FIG. 6 is a plan view of the pedal clavier and switch mechanism operated thereby;

FIG. 7 is a fragmentary, vertical, sectional view of a pedal clavier and switch mechanisms taken along the line VII—VII of FIG. 6; and

FIG. 8 indicates how music is rendered by the arrangement contemplated herein.

FIG. 1 shows, in wiring diagram, the chord tone selecting section of an electronic organ, in which chord tone signals 31 are connected to pedal switches 2 and then to chord button switches 5. The organ have a bass tone section controlled by pedals, but said section is omitted in FIG. 1, because the base tone section may be the same as in conventional organs. The input chord tone signals are of twelve different notes in an octave shown in FIG. 1 as C, C#, D, D#, E, F, F#, G, G#, A, A#, and B. The chord types are major (MAJ.), minor (MIN.), 7th, diminished (DIM.) and augmented (AUG.), as shown in FIG. 3.

Detailed description of FIG. 1:

(a) Chord tone signals 31 C, C#, D, . . . B (twelve signals)

(b) Mechanism of the pedal switches 2

(1) Each pedal includes eight movable contacts 11.

(2) Throughout all pedals, there are bus-bars 3 of eight stages.

(3) Switch mechanism forms one unit per pedal. These are interconnected so as to carry out operation of lock-release type.

(c) Connection diagrams of pedal switches 2 (as shown in left side portion of FIG. 1)

Referring to the stages of bus-bars, the following description may be adopted.

Stage:

First	Root note.
Second	Minor third note.
Third	Major third note.
Fourth	Diminished fifth note.
Fifth	Perfect fifth note.
Sixth	Augmented fifth note.
Seventh	Diminished Seventh (i.e. major sixth) note.
Eighth	Minor seventh note.

(d) Construction of chord button switches 5

- (1) Each button includes three or four movable contacts.
- (2) Throughout all buttons, there are bus-bars 12 of four stages. (These four stages are further commonly connected and taken out as one signal wire 32.)
- (3) The switch mechanism is made to be one unit per button and they are independently operated from one another.

(e) Connection diagram of chord button switches 5 (as shown in right side of FIG. 1).

Description relating to bus-bars of the pedal switch connected to each movable contact with be as follows:

Button name	Stage number of bus of pedal switch			
	1st stage	3rd stage	5th stage	
MAJ.				
MIN.	1	2	5	
7th	1	3	5	8th Stage
DIM.	1	2	4	7
AUG.	1	3	6	

Theoretically, there is one chord of each type for each bass sound, so that playing of all the chords together with the corresponding bass sound would require sixty combinations. At present, the playing of the combinations of chords and bass sounds requires considerable dexterity on the part of the performer.

Generally speaking, the present invention contemplates providing an arrangement whereby the bass tones formed by depressing any pedal, e.g., pedal 1 or pedal 6 of the pedal clavier shown in the organ of FIG. 2, are so interrelated as shown in FIG. 1 to the chord button 4, that when the bass pedal, e.g., pedal 1 is depressed, the chords played by the chord button will be the chords in the key of the note name of particular pedal, and this situation will continue until the next pedal, e.g., pedal 6 is depressed, at which time the key of chords will then correspond to the note name of pedal 6.

To begin our explanation of the invention, we will first describe in general the production of bass tones. Looking for the moment at FIG. 7, there is shown a longitudinal cross sectional view of pedal 1. Forgetting about chords and chord tone signals for the moment, there is shown in FIG. 7 a pedal 1, a spring pivot 7, a return spring 8, a driving arm 29 fastened to pedal 1 by a rod 28 and a bass contact actuating ladder 30. Suffice it to say for the present that by depressing pedal 1, driving arm 29 will be lowered, ladder 30 will drop closing switch contacts completing a circuit to the apparatus in the organ which produces the bass tones. With this brief explanation as to how pedals from bass tones we can now proceed to FIG. 1 and show how these bass tones are interrelated to chord tones produced by pressing the chord buttons, e.g., button 4. In general, this interrelation is carried out by two switch mechanisms. The first of these switch mechanisms is switch mechanism 5, one such mechanism being coupled to each of the chord buttons 4, while the second of these switch mechanisms is switch mechanism 2, one such mechanism being coupled to each of the pedals 1. In order to make a chord sound it will be necessary for both of these switch mechanisms to be in the closed position. But a chord is a composite sound made up of several tones. Therefore, the switch mechanism coupled to the particular type of chord will only have the number of contacts required to produce that chord. These contacts are designated by 16 on FIG. 1. On the other hand, the switch mechanism coupled to the pedal will at some time or other be associated with every type of chord so that it must have sufficient contacts to provide every possible tone combination. The tones forming the chord of course will be those wherein the contacts of both switch mechanism are in the closed position.

The construction of the chord button switch 5 and its

mechanical relation to a manual chord button 4 is shown in FIG. 5. When the chord button 4 is manually pressed downward, its lever 4A deflects downward with a return spring 13 as the pivot, and a driving arm 14 which is fixed to the said lever drives the actuating ladder 15. Accordingly, the electrical contact is made between the resilient contacts 16 and the bus-bars 12 to close their respective circuits. When the chord button is released, it returns to its original position, and the said circuits are opened.

FIGS. 6 and 7 show the construction of the pedal clavier and switch mechanisms. The switch mechanism 2 comprises frames 17, 18 and eight resilient contacts 11 consisting of switch plate 19 and plate 20 whose plane, as shown, is perpendicular to the plane of the paper. The frames 17 and 18 hold the switch plate 19 and plate 20 therebetween and are tightened by flat head machine screws 21. The plate 20 is provided with a plurality of small holes and the resilient contacts 11 are so inserted into the said holes that a connection is made between contacts 11 and the bars 3 attached to the plate 20. Latter bushes 22 are attached to frames 17 and 18, and a slidable actuating ladder 10 having a plurality of holes is fitted to said ladder bushes 22. The ends of the said resilient contacts 11 are inserted with said holes of the ladder 10. With the upward and downward movement of the actuating ladder 10, the resilient contacts 11 and bars 3 perform the switch make and break actions. The lower ends of the actuating ladder 10 is in contact with an actuating spring 9. Accordingly, the switch mechanism 2 is driven by the up and down motion of the actuating spring 9.

The pedal chassis 23 is provided with a locking arm 25 having a shaft 24 which is pivotally mounted at both ends. To this shaft 24 are attached thirteen ratchets 26 at the position of the pitch lines of the pedal keys, the end of said each ratchet being latched to the end of each corresponding actuating spring 9. Accordingly, said ratchets are rotated with rotation of the shaft 24. The operation principle of this mechanism is as follows.

When any certain pedal is depressed, this pedal moves downward around its corresponding return spring 7, whereby the actuating spring 9 moves downward and actuating ladder 10 is lowered, thus forming a closed circuit between the eight resilient contacts 11 and eight bars 3. At the same time, the driving arm 29 fixed to the rod 28 is pushed down by the pedal 1 and the locking arm 25 is rotated counterclockwise (in FIG. 7) around the shaft 24, whereby all the ratchets 26 attached to the shaft 24 are rotated so as to be detached from the ends of the return springs 9. Upon release of the depression force of the pedal key 1, this pedal key 1 is restored and the driving arm 29 is restored, so that the locking arm 25 is restored clockwise by means of a rotating spring 27, whereby all the ratchets 26 are also restored. Since the relative relation between the ends of the ratchet 26 and the ends of the actuating springs 9 are selected so that the ends of the ratchets 26 are restored somewhat faster than restoration of the spring 9, the end of the actuating spring 9 of the pedal 1 which was just depressed is latched to the end of the ratchet 26, so that it cannot be restored to its original position. Accordingly, the actuating ladder 10 is maintained at its operating state and eight resilient contacts 11 and eight bars 3 are maintained in the enabling states forming closed circuits. The ends of ratchets 26 except the ratchet 26 of the depressed pedal 1 are so constructed that, when they are in the restored state at stand-still, they are bent due to abutment with ends of the actuating springs 9, because the other actuating springs 9 whose pedals were not depressed have not been moved, the circuits between the other resilient contacts 11 and bars 3 are maintained in the opened state. When the next pedal 6 is depressed, the rod 28 of that pedal 6 is pushed down again by the driving arm 29 of this pedal, and again locking arm 25 is made to rotate counterclockwise

and all the ratchets 26 are detached from the ends of the opposite actuating springs 9. However, at this time, the first-mentioned ratchet 26 which has formed closed circuits between the first-mention resilient contacts 11 and bars 3 by the depression of the pedal 1 are also detached from the end of the actuating spring 9, so that upon said detachment the first actuating spring 9 is restored to its original position by the spring force thereof so as to push up its actuating ladder 10, whereby the circuit between the first resilient contacts 11 and bars 3 are opened. With regard to the pedal 6, the same operation as in the case of the depression of pedal 1 takes place. In this manner, closed circuits between the eight resilient contacts 11 and bars 3 of the second pedal are formed and when the depression of the second pedal 6 is released, the closed circuits of said second pedal 6 are maintained in their closed states as in the case of depression of the first pedal 1. As described above, the switching mechanism 2 is constructed so that during performance, closed circuits are formed between the resilient contacts 11 and bars 3 corresponding to the pedal which has been last depressed. As shown in FIG. 1, the input chord tone signals 31 pass through input terminals 31, resilient contacts 11, bars 3, and then the corresponding bars 12 and closed contact 16 to the output terminals 32 so that when any one of the five chord buttons, that is, major, minor, 7th, diminished, and augmented chord buttons is depressed its corresponding accompaniment tone is produced, for example, when the 7th chord button is depressed, 7th chord in key signature of the pedal which has been in its held state will be produced.

The pedal keys are 13 in number and are positioned in an easily understandable order of the musical scale. The aforesaid chord buttons for selection of the chord types are merely 5 in number. By the mere combination of the above said pedal keys and buttons, any chord from among 60 chords can be played at will. The actual method of playing music by means of the chord selection device of the present invention will be better understood by reference to FIG. 8.

In FIG. 8, the music shown at the top of the figure in three-row stave is rendered in the way as shown at the bottom of the figure, the melody notation being played on the conventional solo keyboard (shown only in FIG. 2), the chord notation by the chord buttons 4 and the bass notation on the pedal clavier.

By depressing the corresponding pedal at the notation of the bass notes C, F, C, C, G, G, C, and C, and pressing the proper chord buttons at the symbols M (capital M means major) and 7th, the composition can be played in an extremely simple manner.

The foregoing may perhaps be better understood by again referring to FIG. 1 while studying Table 1 below:

TABLE 1

	Circuit passing through the pedal switch mechanism	Chords				
		Maj.	Min.	7th	Dim.	Aug.
Bass Note—C—.....	C	C	C	C	C	C
	D#	E	D#	E	D#	E
	E	G	G	G	F#	G#
	F#					
	G#				A	
Bass Note—C#—....	A#	C#	C#	A#	C#	C#
	C#	F	E	C#	E	F
	E	G#	G#	G#	G	
	F					A
	G#			B	A#	

As can be readily seen from the foregoing Table 1, the notes for each chord corresponding to bass notes C and C# were obtained by following the circuit lines 33 indicated in FIG. 1. Table 1 is of course to be extended to cover all of twelve bass tones.

As will be apparent from the above description of the example of actual method of playing, once a certain pedal 1 is depressed, the combination of tones for the five manual chord buttons 4 are determined for the chords, the root tone of which is the tone of the same note name with said depressed pedal. If a chord button is pressed, the switch contacts for that button are closed and the combinations of tones for the chord of the type corresponding to the pressed chord buttons and in the key corresponding to the lastly depressed pedal will be played. When the next pedal is depressed, its eight switch contacts are closed and the tone value of the five chord buttons so change that the chords correspond to the root tone of this next pedal. Therefore, it is possible to play the instrument by selecting the chords in combination of the chord key determined by the foot operated pedal and the chord type determined by the finger operated chord button. Special skill is not required, and there is no necessity of memorizing the difficult chord button arrangements heretofore required for musical performances on the organ. The only requirement is to remember the arrangement of 13 pedal keys and 5 manual chord buttons. Thus, it is possible to render musical performances which are the same as those possible on organs demanding a high degree of playing skill. Furthermore, the system of the present invention affords several, substantial advantages such as the fact that acquired skill on the pedal keys, and the chord composing mechanism permits free use of the hands and feet to play more complicated compositions.

Since it is obvious that many changes and modifications can be made in the above described invention without departing from the nature and spirit thereof, it is to be understood that the invention is not to be limited to the details described herein except as set forth in the appended claims.

What we claim is:

1. A chord selecting device in an electronic organ wherein the key of chords to be played is determined by the pedal and the type of chords by the chord button comprising in combination; a chord key selector having associated key selector switches and a chord type selector having associated type selector switches, said key selector switches having a plurality of output terminals each corresponding to the degree number necessary for chords and common to all keynotes and a plurality of first contacts for each keynote being respectively connected between the output terminal and the chord tone source by the tone name of the same degree number as the output terminal, said type selector switches having a plurality of second contacts for each chord type being respectively connected between a total output terminal and said key selector switches by the degree number which constitutes said each type of chord.

2. A chord selecting device in an electronic organ according to claim 1, in which the chord key selector is composed of pedals having associated pedal switches and the chord type selector is composed of chord buttons having associated chord button switches, said pedal switches having eight stages of bus bars each common to all pedals, each stages corresponding to a first, a minor third, a major third, a diminished fifth, a perfect fifth, an augmented fifth, a diminished seventh and minor seventh degree of note and eight first movable contacts engaged with said bus bars for each pedal being connected to the chord tone source by the tone name of the corresponding degree number as the bus bar, said chord button switches, having second contacts being connected between a total output terminal and the first degree bus bar, the major third degree bus bar and the perfect fifth degree bus bar for the chord button of a type "major," between the total output terminal and the first, the minor third and the perfect fifth degree bus bars for the chord button of a type "minor," between the total output terminal and the first, the major third, the perfect fifth and the minor seventh

degree bus bars for the chord button of a type "7th," between the total output terminal and the first, the minor third, the diminished fifth and the diminished seventh degree bus bars for the chord of a type "diminished," and between the total output terminal and the first, the major third and the augmented fifth degree bus bars for the chord buttons of a type "augmented."

3. A chord selecting device in an electronic organ according to claim 2, in which the pedal switches are of the block-release type each switch for the corresponding pedal being kept locked when the pedal is depressed until another pedal is depressed and said pedals have third contacts for switching bass tones.

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U.S. Cl. X.R.

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