Nov. 20, 1928.

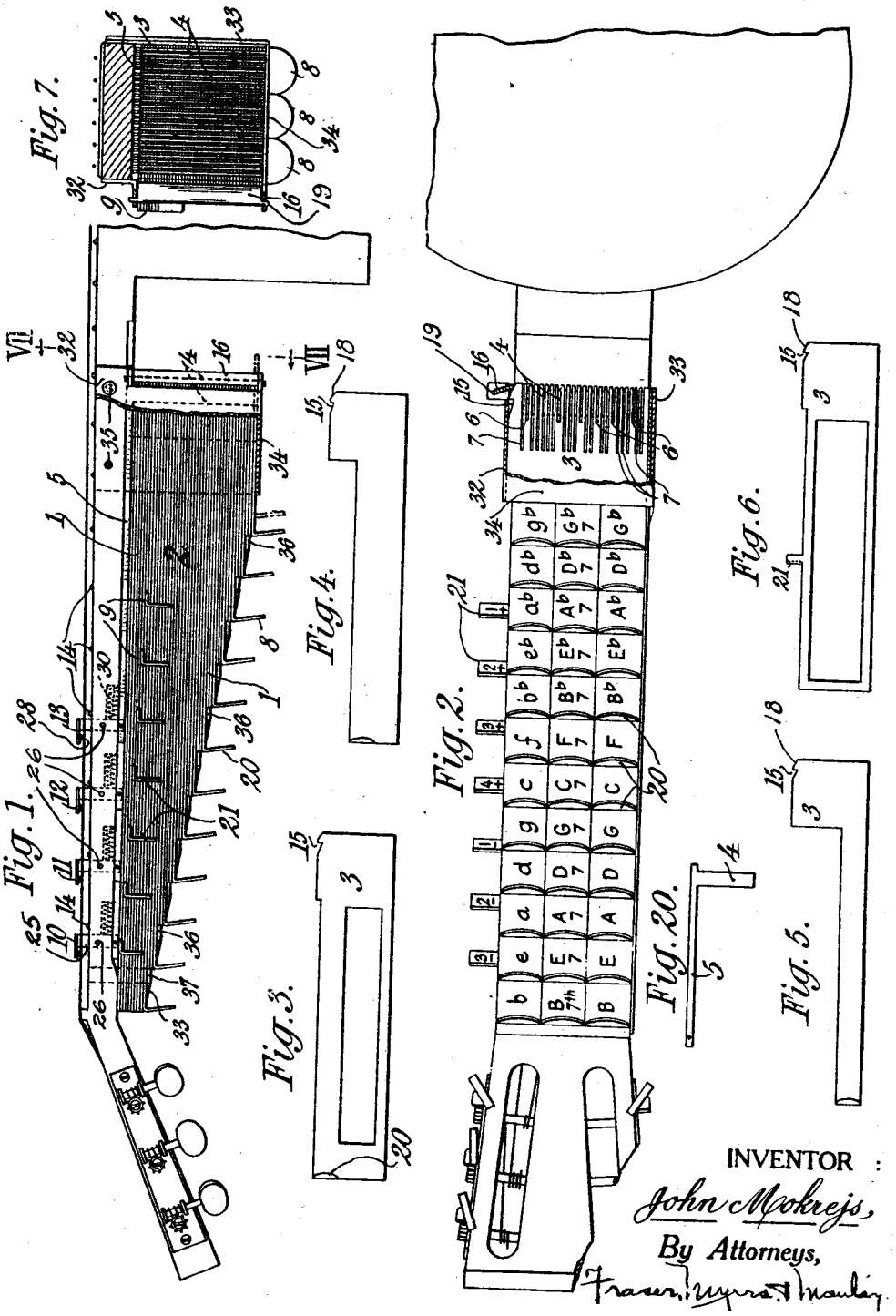
J. MOKREJS

1,692,560

STOPPING MECHANISM FOR STRINGED MUSICAL INSTRUMENTS

Filed Nov. 27, 1925

4 Sheets-Sheet 1



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STOPPING MECHANISM FOR STRINGED MUSICAL INSTRUMENTS

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Fig. 8.

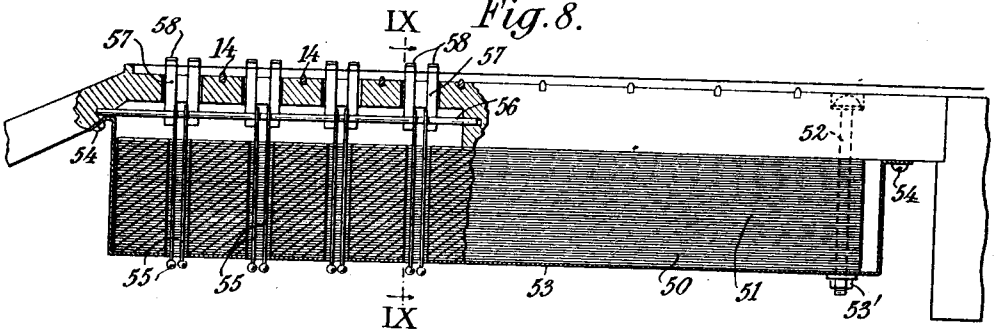


Fig. 10.

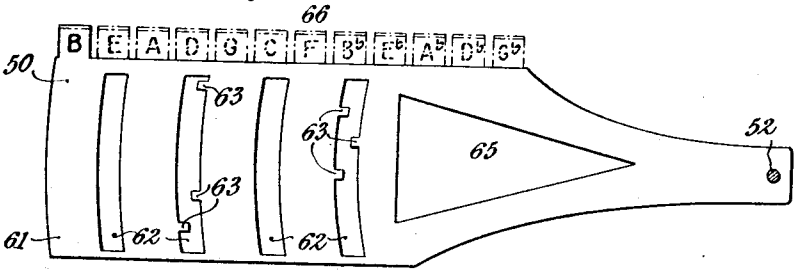


Fig. 6.a

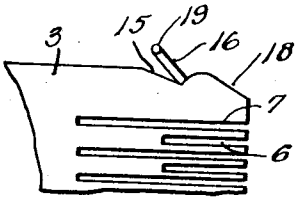


Fig. 9.

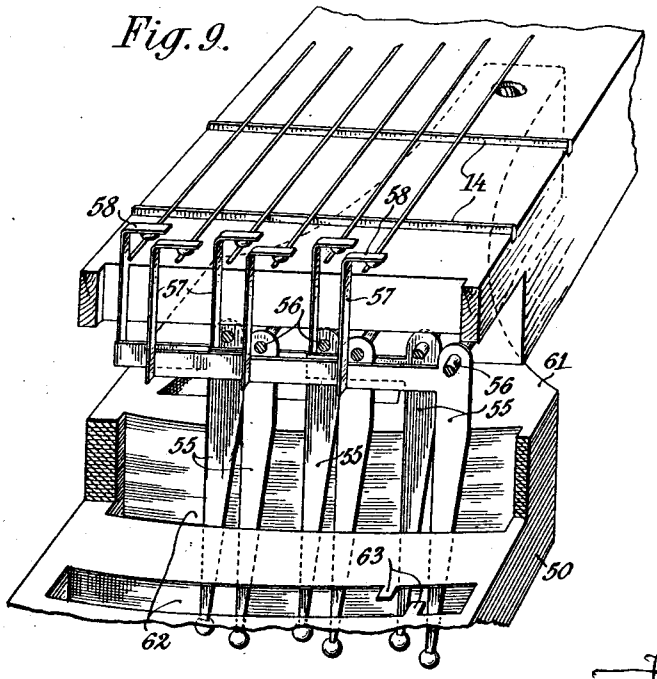
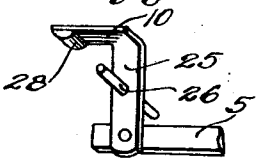


Fig. 6.b



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4 Sheets-Sheet 3

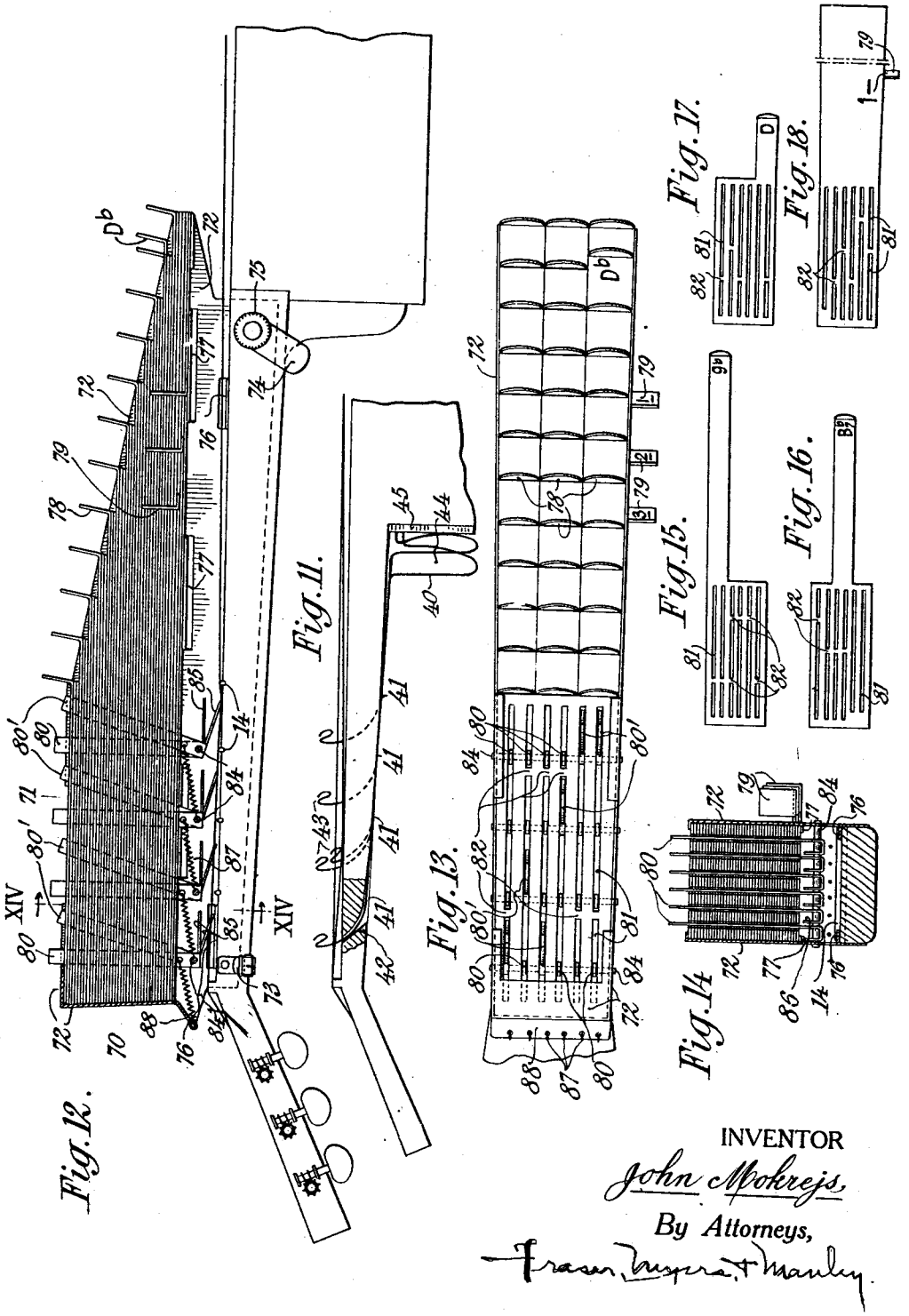


Fig. 12.

Fig. 11.

Fig. 13.

Fig. 14

Fig. 15.

Fig. 16.

Fig. 17.

Fig. 18.

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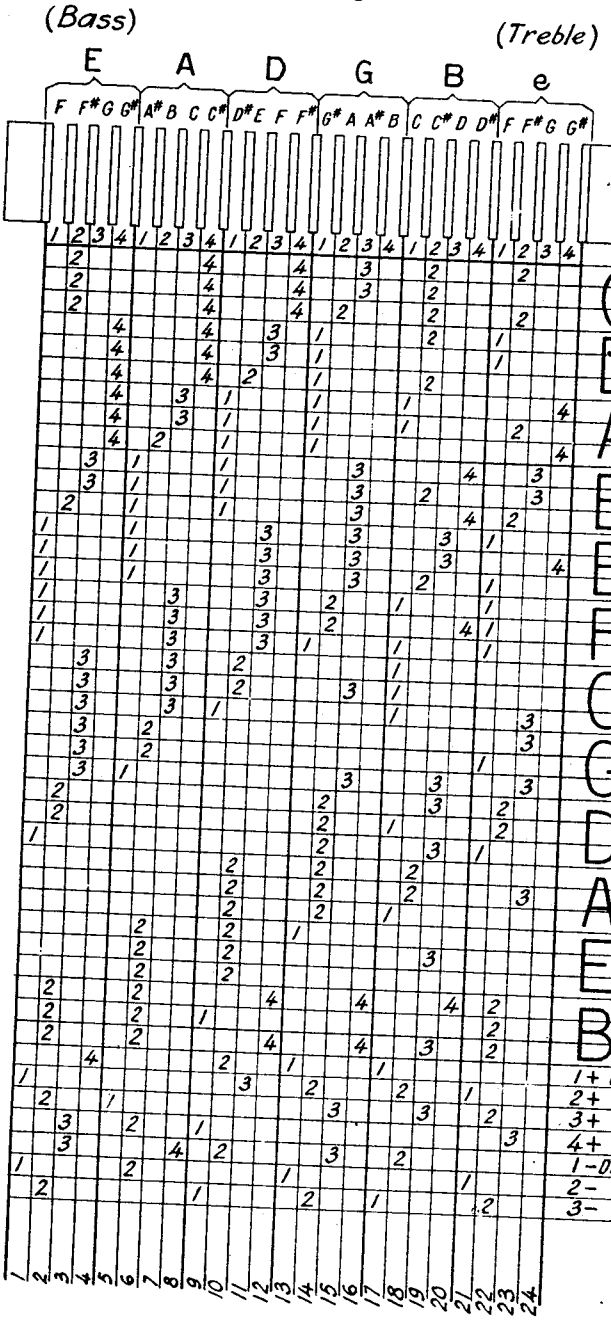
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STOPPING MECHANISM FOR STRINGED MUSICAL INSTRUMENTS

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4 Sheets-Sheet 4

Fig. 19.



G♭ Major — Dominant Seventh — Minor (F#)

D♭ Major — Dominant Seventh — Minor (C#)

A♭ Major — Dominant Seventh — Minor (G#)

E♭ Major — Dominant Seventh — Minor (D#)

B♭ Major — Dominant Seventh — Minor

F Major — Dominant Seventh — Minor

C Major — Dominant Seventh — Minor

G Major — Dominant Seventh — Minor

D Major — Dominant Seventh — Minor

A Major — Dominant Seventh — Minor

E Major — Dominant Seventh — Minor

B Major — Dominant Seventh — Minor

1+ Augmented Triads E.A♭.C.

2+ " " F.A.C#

3+ " " F#.B♭.D.

4+ " " G.B.E♭

1− Diminished Seventh Chords E.G.A#.C#.

2− " " F.G#.B.D.

3− " " F#.A.C.D#.

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UNITED STATES PATENT OFFICE.

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STOPPING MECHANISM FOR STRINGED MUSICAL INSTRUMENTS.

Application filed November 27, 1925. Serial No. 71 658.

This invention relates particularly to automatic stopping or fingering devices for stringed instruments of the type having a plurality of strings, upon each of which a number of different tones may be produced by varying its effective vibrating length. The guitar, banjo and lute are, for example, instruments of this kind. The invention has for its object to provide means whereby all the strings of such instruments will be automatically stopped or fingered to produce a variety of chords. Each of such chords is under the control of a single finger piece or key. The chords are sounded in the usual manner by stroking the strings with a plectrum or with the fingers, but the control of the stopping of all the strings for any given chord is simultaneously effected by the movement of a single key.

Another object of the invention is to provide a chord control device which is of rugged construction and relatively free from complicated parts and multiplicity of elements.

A further object of the invention is to provide a simple, compact and convenient arrangement of chord-controlling keys for musical instruments whereby keys required for the production of chords in correct harmonic sequences and in any musical key will be found grouped closely together.

The invention also aims to provide means for automatically locking the fingering of a given chord after it has been automatically set up through the manipulation of any given key or actuating member, until a subsequent chord is set up by the actuation of another key. This leaves the player's hand entirely free to pass to a succeeding key after setting up a chord, the fingering of the original chord being maintained without any effort on the player's part. Other objects of the invention will be hereinafter set forth in connection with the detailed description of the invention, reference being had to the accompanying drawings, in which,

Figure 1 represents a side elevation of the device applied to the neck of a guitar.

Fig. 2 shows a plan view of the same device viewed from the bottom.

Figs. 3, 4, 5 and 6 illustrate in plan view four different types of actuating plates or chord selector plates used in the device shown in Fig. 1.

Fig. 6ª is an enlarged fragmentary plan view of the plate-locking device, the plate being locked in operative position.

Fig. 6ᵇ is an enlarged perspective view of one of the string-stops shown in Fig. 1.

Fig. 7 is a cross section taken along the line VII—VII of Fig. 1.

Fig. 8 is a side elevation of a modified form of the device applied to the neck of a guitar.

Fig. 9 is a perspective view of a partial section of the device shown in Fig. 8 as it appears when looking along the neck of the instrument toward the bow or resonance chamber thereof.

Fig. 10 is a plan view of the device shown in Fig. 8 as it appears viewed from above, certain of the selector plates having been removed.

Fig. 11 is a side elevation of an instrument having a modified form of hook rod adapted to be used in connection with the selector plates arranged as in Fig. 1.

Fig. 12 is a side elevation of another modified form of the invention constituting an attachment which may be applied to a standard musical instrument as it is normally constructed, and which may be readily detached therefrom if it is desired to play the instrument in the usual manner.

Fig. 13 is a top plan view of the device of Fig. 12.

Fig. 14 is a cross section of a device shown in Figs. 12 and 13 taken along the line XIV—XIV.

Figs. 15, 16, 17 and 18 are plan views of the various types of selector plates employed in the device shown in Figs. 12, 13 and 14.

Fig. 19 is a chart indicating the correct design of every selector plate for the production of musical chords in every key of the scale.

Fig. 20 is a side elevation of one of the hook rods of the device shown in Fig. 1.

The present invention provides a device by which anyone with an ear for music or a comparatively slight knowledge of the principles of musical harmony will be able to perform creditable accompaniment work on the guitar or other instrument of the same general type with scarcely any training whatever. The device has conveniently placed and arranged in scientific grouping, keys or finger-pieces, each one of which controls the stopping of an entire chord on the instrument, each string being appropriately stopped or left open, so that when the entire group of strings is played

each will contribute to the correct harmonic effect. The keys or finger-pieces are arranged so that successive harmonic progressions in any musical key will be found within very close range of each other so that it is rarely necessary to skip from one section of the keyboard to another even in performing the most intricate accompaniment.

According to the invention the keyboard may be arranged to control 43 separate chords which are readily accessible to the player's hand and which need not occupy space materially greater in area than the neck of the stringed instrument. With 43 chords it is possible to produce any usual harmonic progression in any musical key. Obviously it is not necessary to include so large a number of chord control keys, as for ordinary accompaniment uses, control of the chords in 2, 3 or 4 scales would give an adequate range for accompanying high and low voices. An automatic stop-controlled instrument embodying the present invention can be built, furthermore, at a cost not greatly in excess of that of the musical instrument itself where the chord controls are adapted simply to produce chords in a single musical key or scale. In other words, the instrument can be designed to play in one key or any number of keys up to the possible twelve recognized musical keys, (12 major and 12 minor) and the cost of construction will be proportionate to the number employed. The device may be constructed as an attachment which may be applied in a few moments to already existing instruments and readily removed therefrom when it is desired to play the instrument in the ordinary way by manually stopping the strings for various chords. Certain advantages, however, are to be obtained by constructing the musical instrument and the automatic stopping or fingering control therefor as a unit, the construction being thereby rendered more compact and of lower cost than if the instrument and automatic control are constructed separately.

The invention contemplates the use of a chord-sustaining device which, when in operation, automatically maintains the stopping of the strings for any chosen chord until a subsequent chord is set up by the player, by which arrangement the hand is left entirely free to shift from one actuating key to another without haste and without requiring the slightest manual dexterity. The setting up of successive chords by manually operating their respective actuating keys automatically releases the set up of the previously played chord and locks the chord being played. The strings of the instrument over almost the entire bow or sound chamber are exposed so that they may be struck or sounded in the usual manner by the player. The keyboard of the control device may either be arranged above or below the neck of the instrument. If arranged below, the strings will be exposed in the usual way over their entire length, so that the player has access to them along the neck of the instrument and can finger or stop the strings by direct manual operation without utilizing the automatic chord control if he so desires.

It is obvious that the chord control device need not operate on all the strings of an instrument but only on a sufficient number to contribute the notes essential to the production of chords. Three notes are usually all that are necessary to give desired harmonic effects. Any strings not under the control of the chord selector may of course be manually stopped as desired and played in the ordinary way.

The actuating keys may carry suitable musical characters or letters to designate the chords which they control and the musical keys in which they may be employed.

Referring to Figs. 1 to 6 inclusive of the drawings, the chord control device there illustrated is of the type particularly suited to the control of a guitar, and is adapted to be constructed as an integral part of the instrument. The keyboard mechanism is located as shown below the neck of the guitar, so that the strings are accessible to the player's hands over their whole length. The control device illustrated comprises 43 selector plates 1 arranged in a stack or bank 2. At the right-hand end of each of these plates 1 is provided a comb portion 3 into the 24 slots of which pass the vertical member 4 of hook rods 5. One of the hook rods is shown in Fig. 20. Each of the 43 combs forming a part of the actuating plates 1 are cut in a special manner to set up the individual chord arrangement for which the plate is designed. This is accomplished by cutting certain of the slots of the comb sufficiently deep so that throughout the entire motion of such member the vertical portion 4 of the hook rod 5 will freely slide therein and cutting the remaining slots comparatively short, whereby upon a movement of the comb towards the right, the hook rods lying in the short slots will be engaged and actuated by the motion of the plate. The short slots or active slots, as they will be hereinafter referred to, are indicated at 6, and the long or idle slots at 7.

The guitar illustrated is an instrument having six strings, and the automatic control is designed to produce five different fingerings or, in other words, to stop each string in five different positions, there being as shown four string-stop members 10, 11, 12 and 13 co-operating at each string with the first four frets 14 along the guitar neck, the fifth stopping of each string referred to being accounted for by the fact that a note is produced when the string is left open.

There being four stop members 10, 11, 12 and 13 for each string and six strings, there are required twenty-four of such stops in

all and correspondingly twenty-four members for controlling them, the controlling members being the hook rods 5 having vertical members 4 previously referred to.

The vertical portion 4 of the hook rods extend throughout the entire stack of selector plates 2, at the comb portion 3, the comb as illustrated being provided with twenty-four slots which are either short or long depending upon whether the hook rod passing through a given slot is to be actuated by the particular comb or not. Each of the 43 selector plates is provided with a key or finger-piece 20, 21, preferably formed integrally with the plate and extending substantially at right angles therefrom as shown. The keys 20 are preferably arranged in 12 transverse groups of 3, disposed at even intervals over the available length of the stack of selector plates, and extend downwardly as shown in Fig. 1. The keys 21, of which there are 7, extend outwardly from the side of the stack of selector plates, as best shown in Fig. 2. One object of placing keys 21 on the side of the stack of selector plates 2 is to avoid crowding of the keys on the under side of the stack. It is possible to arrange all the finger pieces 20 and 21 in one continuous keyboard underneath the stack of plates, but this arrangement in the space ordinarily available beneath the neck of a stringed instrument results in a too great crowding of the keys, rendering their manipulation difficult. Furthermore, the arrangement of the seven keys 21 on the side of the instrument, results in certain marked conveniences, due to the peculiar use to which the chords which these keys control are put in musical accompaniment. These seven keys preferably control four augmented triads and three diminished 7th chords respectively, which chords, through enharmonic changes, meet the requirement for both of such classes of chords in every musical key. Placing the finger pieces 21 controlling these seven chords, centrally and at the side of the instrument, renders them more accessible from any portion of the main key-board, comprising the three rows of finger pieces 20, then if they were located at either end thereof.

The arrangement of the finger pieces or keys controlling the forty-three different chords which can be automatically set up in the present device is indicated in Figure 2, the musical designation of each key being applied thereto. It will be observed that, according to the arrangement there disclosed, the chords necessary for the production of usual harmonic cadences will be found either immediately adjacent one another or removed by not more than one key either above or below, or to the right or left of one another. The theory of the special arrangement of chord control keys, according to the present invention, will be readily understood by those skilled in the art from a consideration of the following remarks.

Musically speaking, the scales in ordinary use are either major or minor, therefore any major or minor chord may be used as the tonic chord.

A distinct feature of the present invention is that the chord control keys are not arranged in alphabetical order but in the following sequence: B, E, A, D, G, C, F, B♭, E♭, A♭, D♭, G♭ or its inversion G♭, D♭, A♭, E♭, B♭, F, C, G, D, A, E, B, a sequence of perfect fifths. This sequence of perfect fourths constitutes a complete harmonic cycle, and furthermore, it will be noted that the chords at the two ends of the enumerated sequence bear the same effective harmonic relationship to each other as do any two adjacent chords in the the cycle. Furthermore it is obviously possible to obtain the identical advantages of this arrangement by merely reversing the order of the keys.

The arrangement of the chord control keys on an instrument keyboard in the sequence given, clusters all the closely related chords around the tonic chord in such manner that the sub-dominant chords (IV) of the scale in any key occupy the position immediately below the tonic chord, and the dominant seventh chords (V) of the scale in any key are found next above the tonic chord.

The three most used classes of chords, viz., the major, dominant 7th and minor chords are conveniently arranged in long parallel rows, the chord keys in each being arranged in the sequence B, E, A, D, etc., and the keys in each of said rows registering with the keys of the same letter in each of the other rows. According to this arrangement the B major, B dominant 7th, and B minor chord control keys, for example, will be found in alignment and will form a group transverse to the long parallel rows of keys above described. In other words, chord control keys of the same class (major, dominant 7th, and minor) will be found along the same long rows, and chord keys of the same letter will be found in the same transverse groups.

For the reason that the dominant seventh chords of major and minor keys having the same tonic are the same in both keys, the row of keys controlling this class of chords (the dominant seventh chords) is preferably placed between the major and minor key rows where they are equally accessible to both.

Furthermore, the arrangement above set forth enables one to easily transpose an accompaniment from one key to another as the same relative manipulation of keys takes place around every tonic chord. No theoretical difference occurs even in the keys at the extremities of an open key-board, such as the G♭ key, for example, except that a skip must be made from one end of the finger-board to the other. Musically the key-board forms an

unbroken circle, and were it not for a variety of physical difficulties the keyboard might be disposed in the form of a complete circle.

The harmonic sequence hereinbefore referred to and described as commencing with the B chords and ending with the G♭ chords, is, as set forth, theoretically an endless cycle, the major advantage of the arrangement being realized regardless of the point or key in the sequence at which the keyboard starts. However, a certain practical advantage is to be had from commencing the cycle with the B chords and ending with the G♭ chords, because of the fact that the musical keys of B and G♭ are the least used musical keys. Since it is necessary when either the B or G♭ chords are employed as the tonic chord in an accompaniment to skip from one end of the keyboard to the other to reach other chords required in usual harmonic cadences, the placing of the tonic chords of the least used musical keys at the extremities of the keyboard is obviously desirable, these keys being rarely used.

By virtue of the novel arrangement of the chord control keys, should one choose to use dominant seventh chords farther removed than the one on (V) of the scale, it is simply done by taking the 2nd, 3rd, 4th, etc., dominant seventh chord keys above the tonic and play one after another downward in succession, every chord resolving naturally into the chord immediately below it on the key-board.

Control keys for other desired classes of chords, such as the augmented triads and diminished 7th chords, are preferably arranged in rows parallel to the aforesaid long rows comprising the keyboard. These other classes of chords need not, however, be present in equal numbers with the major, dominant 7th and minor chords, for the reason that through enharmonic changes such chords may often be used in several different musical keys as will be readily understood by those familiar with the theory of harmony.

Through enharmonic changes only four augmented triads and three diminished 7th chords are required to enable a performer to introduce such chords into an accompaniment in any musical key.

Because of the general utility of the four augmented trials and three diminished 7th chords, due to their enharmonic character, their control keys are preferably grouped toward the longitudinal center of the main keyboard so that they may be reached from any part of such keyboard with a minimum of effort, thereby being conveniently available for use in any musical key. The aforesaid keys controlling the augmented triads and diminished 7th chords preferably bear indications of their enharmonic uses but this is not essential and the keys may bear purely arbitrary indications, such as +1, +2, +3, and +4 for the aumented triads, and −1, −2, and −3 for the diminished 7th chords. A correct representation of certain of the enharmonic uses of the seven chord control keys is indicated at the bottom of the chart (Fig. 19), which chart will be hereinafter fully explained.

It is to be understood that the arrangement of the keyboard hereinbefore set forth is applicable to a variety of musical instruments, in fact to any instrument in which musical chords may be produced under the control of single keys, and the invention is in no way limited to the use of such a keyboard on the guitar, which has been taken merely by way of example.

All the major chords (first row) preferably bear the following characters B, E, A, D, G, C, F, B, E♭, A♭, D♭, G♭. All the dominant seventh chords (second row) may be indicated by capital letters and the numeral "7" as B_7, E_7, A_7, D_7, etc. All the minor chords (third row) are indicated preferably by small letters, *b*, *e*, *a*, *d*, etc.

Music may be arranged with a character notation corresponding to the above, or to any purely arbitrary designation of the individual chord control keys, by means of which notation, one ignorant of the ordinary musical notation will be able to play any succession of chords required in an accompaniment by reading characters corresponding to the indications on the keys, and following the general appearance of the music for the purpose of ascertaining the rhythm.

In Fig. 19 there is given a table of the correct stopping of the six strings of a guitar, or other musical instrument in which the strings are tuned to the same relative pitches. By means of this table the correct design for every chord selector used in the device as applied to the guitar and other six string instruments, is indicated.

The table is divided into six principal vertical columns corresponding to the six strings of the instrument and lettered in accordance with the relative musical pitch of each of such strings, the columns reading from left to right being indicated as follows: E (bass), A, D, G, B, *e* (treble).

Each of the aforesaid principal vertical columns is subdivided into four vertical sections or secondary columns corresponding respectively to the 1st, 2nd, 3rd and 4th frets of the instrument strings. These secondary columns are headed with characters indicating the correct scale position of the note produced by a string stopped at the fret represented by each of said secondary columns.

The first secondary column is marked F, the second F#, the third G, etc., which means that the (bass) E string when stopped at the first fret will produce the note F, when stopped at the second fret the note F#, etc.

The chart is divided horizontally into 43 rows corresponding to the 43 musical chords controlled by the chord selectors. To the right of these rows are correct indications of the scale position and class of each of the 43 different chords. The seven rows at the bottom of the chart also show the characters +1, +2, +3, +4, 1−, 2−, and 3− which have been arbitrarily chosen to indicate, on the corresponding seven control keys of the instrument, the nature of these particular chords.

The small squares into which the chart is divided by the lines of the aforesaid columns and rows are filled in with numbers from 1 to 4 indicating the fret at which any string is to be stopped for the production of a given chord, this being done to afford a check on the reading of the chart which can be performed purely by considering the position of the square in which one of said numbers occurs.

A few examples will make the use of the chart entirely clear.

If it is desired to lay out the chord selector for the G flat major (or F sharp major) chord, looking to the right of the chart the desired formula will be found to occupy the first row. Study of the first row reveals the following facts: For the production of the desired chord it is necessary to stop the E (bass), A, D, G, B, and (treble) *e* strings in the following positions respectively: E (bass), 2nd fret; A, 4th fret; D, 4th fret; G, 3rd fret; B, 2nd fret; and *e* (treble), 2nd fret. Howsoever the invention may be embodied the selector for the G flat major chord will be found in such manner as to effect the stopping of the several strings in the positions indicated.

If the G dominant seventh chord is desired, for example, the selector must be formed to effect the stopping of the instrument string in the positions indicated by the chart, providing of course, that all the strings of the instrument are to contribute to the chord. Obviously a chord of the equivalent harmonic effect can be produced by striking less than the six strings of the instrument, but the chart in Fig. 19 has been worked out on the basis of having each of the six strings contribute to the musical effect, by which means the maximum fullness of tone is achieved.

The G dominant seventh chord formula will be found about half way down the chart. This formula requires that the E (bass) string be stopped at the third fret, the A string at the second fret, the D, G, and B strings left open, and the *e* (treble) string stopped at the 1st fret.

If the F# augmented triad is desired, the fifth row from the bottom of the chart shows that the selector must stop the E (bass) string at the 2nd fret; the A string at the 1st fret; the D string must be left open; the G and B strings must be stopped at the 3rd fret, and the *e* (treble) string at the 2nd fret.

From the foregoing examples the use of the chart to determine the formula for any other chord selector will be apparent.

The selector plates 1 are for the sake of lightness and the saving of metal variously formed, as indicated in Figs. 3, 4, 5 and 6 respectively. Successive plates in groups of three are arranged with their control keys 8 in transverse rows, the lower plate of each group having its actuating key on the right-hand side, as shown generally in Fig. 7. Fig. 5 illustrates such a plate, the metal in the upper portion of the plate shown in this figure being removed. Skeletonizing of the plates is permissible because the only portion of the plate that is required to be of full width is the comb portion 3 through which the vertical members of the twelve hook rods 5 must pass. The next higher plate in each group of three is controlled by a finger piece located in the center row in Fig. 7. This type of plate is shown individually in Fig. 4, a portion of the metal on the upper side of the plate being removed, as indicated. The finger piece or key controlling the upper plate of each group of three actuating plates having their control keys in transverse alignment, is in the left-hand row, as shown in Fig. 7 and is individually illustrated in Fig. 3.

The seven keys 9 located to the right of the stack of plates, as shown in Fig. 7, control the upper seven of the forty-three plates in the stack, as previously set forth. These upper seven plates may be formed, as shown in Fig. 6, by which construction they are rendered extremely light through the removal of their entire central area, only a sufficient margin 20 being left to provide a frame having adequate rigidity to actuate the comb 3 at the end thereof.

Each of the plates, as before set forth, is provided with a comb 3. Each plate differs from all the others in that its finger piece or key is differently positioned with respect to the comb from any of the rest, and the comb is individually designed to set up its particular one of the forty-three chords through its individual control of the hook bars. The comb slots, because of their small size, are preferably formed in the plates by a sawing or milling operation, although they may be stamped out of the plate. The plates, where an instrument adapted to play only in a limited number of keys is to be made, may be die cast. By this process of manufacture they are necessarily made heavier, but where only a limited number are to be used the weight is not a vital consideration.

On each of the plates 1 is formed in the upper side of the comb portion 3, a notch 15 into which a latch plate or pawl 16 is adapted to drop when the notch is moved thereunder. After a plate has been moved to its right-

hand position, as shown in Fig. 6ª, it will be locked in that position by the engagement of latch plate 16 with the notch 15 and will remain so locked until another plate is moved to the right. The movement of any of the other plates towards the right will cause the release of the plate previously locked, by the cam action of the upper right-hand corner 18 of the comb as it passes underneath latch plate 16, the effect being to rotate such plate about a pivotal axis 19 and thereby lifting its lower edge entirely out of the notch 15 of the previously locked comb.

Furthermore, when the plate controlling the stopping of a particular chord is released it will be returned by the action of one or more of springs 30, the string stopping members 10, 11, 12 and 13 together with hook bars 5 controlled thereby, being also restored to their normal or inoperative position by means of the same springs 30 which are preferably concealed in slots within the neck of the instrument, as shown, and adapted to directly engage the lower portion of each of the arms 25. Obviously the restoring springs may be situated at any other points so long as they act to return the various parts of the device to inoperative position.

The string stopping members 10, 11, 12 and 13 are preferably formed of light sheet metal, as shown in Figs. 1 and 6ª, a vertical arm portion 25 thereof passing through slots in the neck of the instrument and being pivoted therein upon pins 26 passing transversely therethrough. The lower end of the said vertical arms 25 are operatively engaged by hook rods 5 so that when any one of the twenty-four hook rods is moved towards the right, one of the stop members 10, 11, 12, 13 will be rocked counter-clockwise, its string-engaging portion 28 being swung downwardly about the axis 26 and depressing the string beneath it until such string is brought into positive contact with the fret 14, by which means the string is effectively stopped in that position. As is well understood, it is not essential that the strings be brought into contact with frets, as the string stopping members may themselves alter the effective vibrating length of the instrument strings after the manner of stopping the strings in playing a "Hawaiian" or "steel" guitar, or they may, in co-operation with a smooth fingerboard effect the stopping of the strings as this is ordinarily accomplished in the violin. In all but the "steel" guitar method, the string stopping members are preferably shod with some vibration damping material, as indicated at 28.

The actual spring engaging portion of the string-stopping members 10, 11, 12 and 13, indicated at 28, is ordinarily, as above set forth, formed of some fairly soft non-metallic material, such as felt or leather, which is cemented or otherwise fastened to the stopping member. The object of this is to avoid any possible mechanical sound of the member engaging the strings and also to prevent momentary false stopping of a string, which would be brought about if it were engaged by a metallic contact at a point not immediately above the correct position of the frets 14 before the string had been sufficiently depressed to engage such fret. The soft string-engaging member 28 also effectively deadens the vibration of the strings over the portion between the fret which momentarily engages the string and the left-hand end of the guitar neck. The use of these soft string-engaging members is not essential, but is a refinement which adds to the perfection of the instrument.

The stacked selector plates 1, are retained in proper position by being mounted between two shields 32 and 33, the upper shield 32 (in Fig. 1) being only of sufficient width to cover the comb portion of the plates while the lower shield 33 (appearing on the lower side of Fig. 2) extends over the entire length of the plates and provides a smooth surface upon which they may freely slide. When the instrument is being played, it occupies substantially the position shown in Fig. 1, lying on its edge across the lap of the player, the right-hand of the player being free to sound the strings in the usual manner, while the neck of the instrument lies in the palm of his left hand, the keys 8 and 9 being actuated by the player's thumb. With the instrument in the position described, the selector plates will have no tendency to bind upon each other, because they occupy a substantially vertical plane, the weight of each resting independently upon the lower shield 33. The shields 32 and 33 are connected by a bottom plate 34 which is preferably formed integrally with the shields. The bottom plate and the two shields comprise a frame in the form of a U, the upper portions of which are bolted to the neck of the instrument by small through bolts 35. The lower shield 33 may also be provided with small guide lugs 36 which are bent inward at the end of each transverse group of plates to form a series of stepped supports for the 12 groups of plates. These lugs may be extended by a strap member which passes completely around the stack of plates and is fastened to the neck of the instrument, one of these straps being shown at 37 in Fig. 1. It is necessary that such strap be made narrow so that it will not interfere with the keys 8 upon the forward actuating movements of the plates.

A modified form of hook bar and string stop assembly is illustrated in Fig. 11. The arrangement of keys, actuating plates, and comb (none of which are shown in Fig. 11) would be similar in every respect to those previously described. The hook rods and string-stop members, however, in the pres-

ent instance are formed as a unit, both portions being formed from a single piece of flexible wire. Steel wire is perhaps best suited for this purpose. The wire is bent to form a vertical arm 40 which is adapted to pass through the comb of the actuating plate, taking the place of the vertical member 4 of the previously-described hook rods. To the left of the upper portion of section 40 the wire is bent in a substantially horizontal direction to follow the surface of the neck of the instrument to a point 41, where it enters a curved tube or channel 42 in the instrument neck, the position and curvature of said channel being so related to the frets 14 beneath the strings that the portion of the hook rod extending therethrough will emerge at a point immediately below the location for the correct stopping of the string at a particular fret. The upper portion of the wire hook rod is bent as shown to provide a string-stopping member 43.

The section of the wire hook rod to the left of the vertical hook portion 40 is bent to form an open loop or U 44, the end of the wire being held in proper position by inserting in a socket bored in a reinforcing piece 45 at the left-hand end of the instrument bowl. The special hook rod being made of resilient wire affords, when bent into loop 44, a suitable spring means for returning it after being forced to the right by a selector plate to its normal inoperative position. Right and left-hand positions of the hook rods are shown in Fig. 11. When the rod after being actuated is returned by the action of its U spring, the resilient wire of which it is formed will readily be moved through the curved channel 42, causing the release of the string stopping portion 43 through a substantially vertical movement. Conversely, when the movement of a selector plate draws the hook rod to the right, the wire will be pulled down through curved channel 42, causing the engagement of the string stopping members.

In Figs. 8, 9 and 10 there is illustrated a second embodiment of the invention, differing quite widely in structure from the embodiment previously described and yet capable of performing precisely the same functions. Furthermore, the two devices are in principle entirely the same. In the embodiment now to be described the actuating or selector plates 50 are arranged in a stack 51, beneath the neck of the instrument. These plates, instead of being adapted to slide longitudinally, are pivotally mounted upon a common axis 52 and adapted to swing transversely over comparatively limited arcs. Details of the individual plates will be found in Figs. 9 and 10. The stack or bank of plates is retained beneath the instrument neck in a housing 53 which preferably comprises a metal box partially encasing the plates and of a size sufficiently large to permit the free movement of the plates over their limited operating arcs. The case 53 is fastened to the instrument in any suitable manner as by means of screws 54. The common pivot of the plates is preferably formed by a bolt 52 passing completely through the bank of plates and the neck of the instrument, a nut 53′ being applied to the bolt on its lower end, which end also projects through the housing 53, as shown.

The instrument while being played is to be held on its edge across the player's lap, the strings facing outward so as to be played in the usual manner, the neck of the instrument being held in the player's left hand and the keys actuated by the fingers of this hand. With the instrument in this position there is no tendency for the plates to be pressed together, since they all occupy a substantially vertical plane and consequently each will freely fall of its own weight against the lower side of the casing 53, which position represents their normal, inoperative position.

In place of the hook bars previously described the present embodiment of the invention employs rocking arms 55 pivoted on longitudinal shaft 56, the string stopping members 57 being formed as an integral part of the rocking arm 55. The form and arrangement of the respective parts above-mentioned are best shown in Fig. 9. This figure, however, is a perspective view of a section of the instrument taken along the line IX—IX (Fig. 8) looking towards the bowl of the instrument, and consequently only shows 6 of the 24 rocking arms employed. The control of the strings is effected by means of four transverse groups of string stops, just as in the embodiment previously described, this arrangement providing control over five frets on each string or 30 frets in all. Under the automatic control of the instrument it is possible to produce the same 43 different chord combinations which were possible with the instrument previously described and which, as before stated, enables one to follow any of the recognized harmonic progressions or formulas in any key. Obviously an instrument capable of producing fewer chord combinations may be more simply constructed if desired. Furthermore the constructions herein described are obviously applicable where any greater number of chord combinations is desired.

It will be seen that a movement of the lower end of one of the rocking arms 55 to the right (Fig. 9) will produce a downward component of motion in the arm 57 thereof which will cause the string stopping portion 58 to engage the string beneath it, and upon a continuation of the movement, depress such string to a point where it will engage the fret 14 and thereby be effectively stopped to that length. Movement of the arm 55 in the opposite direction will correspondingly release

the string-stopping member from the spring. The portion of the rocking arm 55 below the axis 56 is designed to exceed the mass of the portions of the arm above such axis, the upper portions of the arm including members 57 and 58. By this means when the instrument is tipped on its side to place it in the correct playing position previously described. The rocking arms 55 will normally assume under the action of gravity the positions indicated in Fig. 9, the string-engaging members 58 being swung entirely free of the strings. Since the plates which actuate the locking levers are also held in their normal or inoperative position by gravity, it will be understood that the present embodiment of the invention requires no springs whatever in its construction, gravitational forces alone being depended upon to return all of the operating parts to their inoperative positions.

One of the actuating plates 50 will now be described in detail, it being understood that each of the other plates is in principle identically the same, the only difference between any of them being the various positioning of the parts required for the production by each of its individual chord set up.

Let us take, for example, the bottom plate of the stack. This plate appears at the front of the stack of plates, as illustrated in Fig. 10. This actuating plate or selector as it is properly termed, controls the setting up of the B chord on the instrument, and is swung through its actuating arc by the application of pressure on the finger piece marked B appearing at the extreme left of the key-board. The particular selector described will be referred to hereinafter as plate 61. This plate is provided, as shown, with four transverse slots 62 which are slightly curved to conform to the arcs of circles drawn about the axis 52 as a center. These slots are, unless obstructed by actuating lugs 63, of sufficient width to freely receive the lower arms of the rocking levers 55, and consequently may be swung about the axis 52 without moving the said rocking levers except in accordance with the following arrangement. The production of any chosen chord requires the actuation of a certain number of the string-stopping members 57 in correct positions on the several strings. This is brought about by providing actuating lugs 63 at suitable points along the slots 62. These lugs project into the slot a sufficient distance to engage the actuating levers 55 passing through the slots, so that a movement of the plate 61 in a counter-clockwise direction, as indicated by the arrow in Fig. 9, will cause the actuation of every rocking lever 55 occupying a position immediately adjacent to one of the actuating lugs 63.

Certain chords will require the stopping of every one of the strings of the instrument. The production of such chords will necessitate the presence of six actuating lugs to move the necessary six string-stopping members 57 into engagement with the strings through the movement of their respective rocking arms 55. The B chord is of this type and requires, as shown, six actuating lugs. As indicated in the chart shown in Fig. 19, the details of which will hereinafter be more fully set forth, the production of the B chord requires the stopping of strings only at the second and fourth frets, as follows: E (base) and A strings, second fret; the D, G and B strings, fourth fret; and the treble E string, second fret. Because of the fact that the strings are required to be stopped only in the second and fourth positions, the actuating lugs 63 are all situated either in the second or fourth slots 62 counting from the left, three lugs appearing in the second slot and three lugs in the fourth. It will be observed that lugs controlling the stopping of the even numbered strings counting from the base E string occupy a position to the right of the center line of slots 62, while the lugs controlling the odd numbered strings appear to the left of such line. This is occasioned by the staggered arrangement of the rocking levers 55, which staggering is necessitated because of the limited space between the strings of the instrument. It will be understood that the staggered arrangement of the levers 55 and string-stopping members 57 and 58 does not, in any way, impair the accuracy of the pitch of tones produced on the instrument because the effective vibrating length of the string is always accurately determined by the position of the frets 14. A very slight error in pitch might be brought about through haphazardly depressing a string at any point between two frets. The possibility of such an error is minimized by the disposition of the staggered string-stopping members at equal distances to the right and left of the center of the space between frets, so that the pitch of the strings, stopped in various positions, will be substantially accurate providing the instrument is in proper tune to start with.

For the sake of lightness, a triangular portion 65 of the metal of plate 61 has been removed, and it is obvious that the plate may be otherwise cut away to reduce its weight, if desired.

The finger piece or key against which the player presses when he desires to set up the chord controlled by plate 61 is preferably formed integrally with the plate and comprises a simple strip of metal extending transversely from the plate. At the outer end of such strip the metal is bent to form a flattened portion in a plane transverse to that of the plate 61, which flattened portion 66 serves as the key proper against which the player's fingers press.

Each of the forty-three plates comprising the stack or bank 50 differs from the others

in the arrangement of its actuating lugs 63 and the position of its controlling key or finger piece, the said various arrangements of actuating lugs corresponding in each case to the required stopping of the six strings for the production of the chord for which the particular plate is designed. The various positioning of the keys 66 is required to spread the same out into a conveniently arranged key-board whereby each key will be readily accessible to manual control.

The plates 61 are preferably formed with the actuating lugs 63 as an integral part. Suitable stamping dies can be made to cut out the plate, as shown, removing the metal to form the openings of slots 62, but leaving in proper positions the lugs 63 projecting into said slots. A separate die may be used for each plate or the various plates may be produced by a die having adjustable portions adapted to vary the position of the lugs cut thereby.

As in the embodiment previously described, the key-board is composed of three full rows of finger pieces, the first row controlling chords designated, as follows, beginning at the left end of the key-board: B, E, A, D, G, C, F, B flat, E flat, A flat, D flat, G flat. The second row, having the finger pieces in substantially transverse alignment with the first, controls the dominant 7th chords corresponding to the major chords of the first row. The third row likewise has its finger pieces in transverse alignment with those of the first and second rows, and each finger piece or key in the third row produces a minor chord corresponding to the major and dominant 7th chords controlled by keys occupying the same transverse row. It is understood that this arrangement of chords may be inverted by placing the G flat chords at the top and the B chords at the bottom, in which case they will read G flat, D flat, A flat, E flat, B flat, F, C, G, D, A, E, B. It will be further understood that the chords designated as E flat, A flat, D flat and G flat may also be designated D sharp, G sharp, C sharp and F sharp, as the two are identical chords.

A fourth longitudinal row of keys may be conveniently placed parallel to the three rows previously described, the seven keys of this fourth row controlling the seven actuating plates or selectors which set up four augmented triads and three diminished seventh chords. These keys are conveniently arranged in the following order commencing at the left end of the row, that is, the end away from the bowl of the instrument. The successive keys will control the augmented triads enharmonically particularly available in the following scale positions: E, G sharp, C; F, A, C sharp; F sharp, B flat, D; and G, B, E flat. Continuing along the row, the last three keys will successively control the diminished seventh chords E, G, A sharp, C sharp; F, G sharp, B, D; F sharp, A, C, D sharp. Thus, as in the previously described embodiment, the present arrangement provides three rows of twelve keys controlling respectively the major, dominant 7th and minor chords arranged in the specially coordinated series B, E, A, D; G, C, F, B flat; E flat, A flat, D flat, G flat. There is also provided a fourth row containing seven keys controlling, as set forth, the augmented triads and diminished seventh chords. In the four rows there are a total of forty-three keys or finger pieces comprising the special key-board, the arrangement of which is the result of extensive study and computation. The peculiar advantages gained by this arrangement of the key-board have been hereinbefore pointed out.

As previously pointed out, the control of five notes on each string, (four by stopping, the fifth by leaving the string open or unstopped) gives the instrument control of a total of thirty notes on six strings. With automatic control of these thirty notes, the actuating plates provided give control of forty-three harmonically different chords, through the use of which any ordinary chord formula may be executed in any key whereby the most intricate accompaniment in any chosen key may be played. Furthermore, it is not in the least necessary that the one performing on the instrument have any conception of the actual positions necessary for the correct stopping of the strings required in the production of a single chord. All the performer is required to know is the correct sequence of chords or harmonic formulas. In many compositions it is only necessary to employ three different chords for the correct accompaniment of the entire piece. The appropriate use of the three chords involved can be very readily learned by one having no knowledge of music whatever.

For the instruction of beginners, as previously pointed out, special musical scores can be written for any desired composition in which the finger pieces controlling the appropriate chords for the accompaniment will be indicated by the letters or musical characters appearing in the score, said letters or characters corresponding to the indications carried by the various finger pieces comprising the instrument key-board. By this means a novice will be able to perform intricate accompaniment work.

A third embodiment of the invention is illustrated in Figs. 12 to 18 inclusive, the device there shown being constructed as an attachment. The entire mechanism of the automatic chord-stopping device is self-contained within a suitable frame and may be readily attached to stringed instruments already existing. The device also is readily removable from such instrument without damage thereto, so that the instrument may at any time

be converted into the usual one, permitting the ordinary manual control of the stopping of the strings when it is not desired to set up the chords automatically.

The embodiment now to be described in detail differs from the two hereinbefore described in several respects, although in principle all the devices are substantially the same in that a variety of chords may be produced automatically by the simple actuation of a single key for each chord desired.

In the present case the individual selector plates 70 are arranged in a stack or bank 71 above the instrument strings. In the form of the device illustrated there are 39 of these selector plates, each plate being under the control of keys or finger pieces projecting therefrom in such manner as to be readily accessible for manual operation. The 36 keys controlling the major, dominant 7th and minor chords of the series B, E, A, D, G, C, F, B flat, E flat, A flat, D flat, G flat are preferably arranged as in the former devices in three parallel rows of twelve keys each, the B major, B dominant 7th and B minor control keys being substantially in transverse alignment, as are also all corresponding major, dominant 7th and minor chord control keys. In addition to the thirty-six keys thus provided, three additional keys are placed in a row to one side of the stack preferably near the longitudinal center thereof. These three additional keys control respectively through enharmonic changes diminished 7th chords for E, G, A sharp, C sharp; F, G sharp, B, D; F sharp, A, C, D sharp. In this embodiment no keys are provided to control augmented triads, the total number of control keys being limited in this key-board to 39.

As has already been pointed out, in none of the various embodiments of the invention is it essential to include augmented keys or even half the number of keys illustrated where an instrument is not required capable of being played in every musical key. Obviously a control device adapted to play in only three keys will require relatively very much fewer controls than the elaborate instrument illustrated which is adapted to play in every musical key recognized in our system of music.

The actuating plates, with the exception of the portions comprising the key-board of the instrument, are preferably completely shielded within a light metal housing 72 which is formed as an inverted U trough, the lower edges of which are adapted to be fastened to the guitar neck by means of a screw clamping device or by simply strapping them together by means of an adjustable strap passing from one edge of the housing around and underneath the neck of the instrument. The left hand end of the housing is shown fastened to the guitar neck by means of a simple strap and buckle arrangement 73, while the right hand end of the housing is illustrated, by way of example, held in place by means of a special form of C clamp 74 passing beneath the neck of the instrument and securely clamping the two sides of the casing against the neck, the clamp being adjusted by means of a knurled thumb screw 75.

The housing 72 is provided with suitably formed lugs 76 projecting inwardly from its walls and adapted to engage the upper surface of the finger board of the musical instrument proper for the purpose of properly positioning the housing carrying the working parts of the device, with respect to the strings and frets of the instrument. At a suitable elevation above the line of lugs 76 a second set of inwardly projecting lugs 77 are formed, these latter serving as guides for the stack of actuating plates or selectors 71 and maintaining said plates at a sufficient elevation above the instrument strings to provide the necessary clearance. The stack of plates is held loosely between the guide lugs 77, and the upper portion of the inverted U housing 72 which passes over them, so that they will freely slide one upon another and yet will be retained in their stacked arrangement with sufficient accuracy to prevent lost motion sufficient to produce rattling between the plates.

It will be borne in mind that the present device, as in the case of the two embodiments previously described, is adapted to be played with the instrument lying on its edge across the performer's lap, so that the weight of the plates has no cumulative effect to produce friction between successive plates, the weight of each resting directly upon its own lower edge, which, when the instrument is turned on its side, will freely slide along the lower side of the U housing 72.

The actuating plates are adapted to slide over a relatively short distance longitudinally of the instrument, the finger pieces 78 controlling the plates being situated at the right hand end thereof, as shown in Figs. 12 and 13. In the present instance the finger pieces move the plates by pulling thereon instead of as in the case previously described moving the plates by pushing. This arrangement has the inherent advantage of requiring plates of lesser thickness than those required to sustain a pushing or compressional strain because of the fact that when under tension there is no tendency whatever to buckle. In fact a metal plate 1/64th of an inch thick has ample tensile strength to actuate the string-stopping levers.

The left hand portion of each actuating plate is slotted to receive six parallel rows of vertical levers 80. Each of the rows of levers 80 controls the stopping of one of the strings of a six-stringed musical instrument such as the guitar, and according to the preferred arrangement there are four levers in each of the six rows controlling the first, second, third and fourth frets of the instru-

ment. Thus, as in the devices hereinbefore described, there will be thirty different notes under the control of the selector plates. The six slots 81 are sufficiently long to receive the four normally vertical levers controlling each string and to permit the free movement of such levers over their operative arcs. As in the embodiment of the invention previously described, the selector plates are each individually provided with a particular arrangement of string stop actuating members which in the present case consist of the bridges 82 which cross the slots 81 at points immediately to the left of the levers 80 that are to be actuated by any given plate.

In Fig. 13 the upper plate of the stack exposed to view is the plate controlling the B major chord. Examination of the chart in Fig. 19 shows that this chord requires the stopping of the following position: E (bass), and A strings 2nd fret; D, G and B strings, 4th fret; and the *e* (treble) string, 2nd fret. It will be seen that the six bridge pieces 82 blocking the six slots are disposed in positions required for the actuation of levers 80 appropriate to the stopping of the strings at the positions indicated by the chart.

Six of the levers are shown moved to the right in Figs. 12 and 13 under the control of the D flat major selector plate which, as shown, has been shifted to operative position. The levers thus displaced from the vertical or inoperative position being indicated by 80′, the remaining 18 of the 24 levers shown, occupy their normal inoperative position.

Figs. 15, 16, 17, and 18 illustrate the selector plates for the G flat minor, B flat dominant seventh, D major, and one diminished seventh (1—) chord, respectively, the various arrangement of the slot bridges or stop actuating parts 82 required for the production of the stated chords being clearly shown.

The levers 80 are grouped, as shown, in four transverse rows of six levers, each of the levers in said groups being pivotally mounted upon a pin 84, the pin passing through the six levers in a group and being fastened at either end of the housing 72 containing the stack of plates. The lower arms of the levers extend transversely to the right, as shown, forming with the vertical arms bell-crank devices. When the upper end of the lever 80 is moved to the right, the lower arm 85 thereof will be swung downwardly. The free end of the lower arm 85 of such bell-cranks is positioned immediately above the strings of the instrument and at points longitudinally along the length thereof suitable to effect the engagement of the strings with the various frets. The arm 85 directly engages the string when the vertical arm 80 of the bell-crank is moved to the right, and disengaged when the arm 80 is moved to the left. The bell-cranks are preferably formed by suitably bending a sheet of metal, as shown in Figs. 12 and 14, to provide the two arms 80 and 85 at right angles to each other, while the metal at the junction of the two arms is bent to form a U 86 through which the pivot pin 84 is passed. The two walls of the U in this manner provide double bearing surfaces for each bell-crank, and the flat extension of the metal arm 85 from the lower portion of the U will lie in a horizontal plane, which arrangement is best suited to the positive engagement of the strings. As shown in the drawings, the vertical arm 80 of the bell-crank device is flat in the plane of the longitudinal axis of the instrument, this arrangement permitting of the grouping of six levers side by side in the width of the instrument neck without crowding or interference.

The bell-crank formed by lever arms 80 and 85 are retained in their normal inoperative position by means of springs suitably located, one arrangement of the springs being shown in Fig. 12. Here coil springs 87 are hooked into the vertical arms 80 at a point somewhat above the pivotal axis, and the springs, which are of the tension type, fastened at points to the left of each lever. With respect to the second, third and fourth transverse rows of levers, the said springs are preferably each fastened to the pivotal axis of the set of levers preceding the lever to which the spring is attached. There being no such natural anchorage to the left of the first transverse row of levers, a special extension 88 may be conveniently formed on the end of the main housing 72, which is perforated to receive the left hand ends of the six springs controlling the first row of bell-cranks. The springs 87 serve not only to return the bell-cranks to inoperative position, but effectively restore any selector that has been moved to the right for the purpose of setting up a chord, to its normal position. It will be understood that there will, at all times, be acting on a selector plate when it has been moved to the right, the cumulative effect of all the springs attached to the several levers 80 which have been moved by the actuation of the plate. According to the chart in Fig. 19, the production of any one of the forty-three chords there tabulated requires the actuation of at least two of the string-stopping levers, while many of the chords require the actuation of six levers. The chord of the type requiring the movement of only two levers is the E minor chord. This chord requires only the mechanical stopping of the second and third strings of the instrument on the second fret, the other four strings being left open. It will be seen that even in the extreme case of the E minor chord there will always be two of the springs 87 acting to restore the actuating plate to its normal position. In the case of chords requiring the stopping of six strings, such for example, as the G flat

major chord, the plates will be acted upon by the resilient force of six of the springs 87.

The same special arrangement of the chord control keys described in connection with the previous embodiment has been preserved in the present embodiment. The peculiar advantages resulting from the special arrangement of the key-board which were particularly described in connection with the preferred embodiment of the invention, are realized equally well in the present form, so that practically every type of musical accompaniment can be played without the necessity of skipping from one section of the key-board to another, all the control keys required for the production of usual harmonic sequences or cadences being found within very close range of one another.

The disposition of the control keys 78 on top of the instrument requires them to be actuated by one of the fingers of the left hand, upon which the neck of the instrument rests, while the side keys 79 may be actuated by the fingers of the left hand, or by the thumb which, when it is required, is conveniently brought into a position above the neck of the instrument.

While various forms of the invention have been hereinbefore particularly described and illustrated, it is to be understood that the invention is not limited thereto, but may be otherwise variously embodied and modified without departing from the spirit of the invention as set forth in the following claims.

What I claim is:

1. A chord control device for stringed instruments, said device comprising a bank of superimposed chord selectors, a plurality of means adapted to effect the stopping of the instrument strings, and members projecting at an angle to the instrument strings through said bank of selectors, whereby said string-stopping means may be independently moved, said selectors being respectively adapted to actuate said members in various combinations whereby the instrument strings may be stopped to produce a variety of chords by the successive manipulation of the said selectors.

2. A chord control device for stringed instruments, said device comprising a bank of chord selector plates, said plates being relatively movable in planes substantially parallel to the common plane of the instrument strings, and a plurality of string-stopping members adapted to be actuated in various chord combinations by the successive manipulation of the said chord selector plates.

3. A chord control device for stringed instruments, said device comprising a bank of superimposed and relatively slidable chord selector plates, a plurality of string-stops, and members projecting through said bank of selector plates whereby said string-stops may be independently moved, said slidable selector plates being respectively adapted to actuate said members in various combinations.

4. A chord control device for stringed instruments, said device comprising a bank of longitudinally slidable chord selector plates, a plurality of hook rods extending through a plurality of said plates, and a plurality of string-stops actuated by said hook rods, said selector plates being individually adapted to actuate the combination of hook rods required to set the said string-stops for the production of a musical chord.

5. A chord control device for stringed instruments, said device comprising a bank of chord selector plates, portions of which have been removed to provide registering through-openings, and string-stop actuating means projecting through said bank of plates and lying within said openings.

6. A chord control device for stringed instruments, said device comprising a bank of chord selector plates, means adapted to hold said plates together in free sliding contact, and finger pieces adapted to individually move said chord selector plates.

7. A chord control device for stringed instruments, said device comprising a bank of chord selector plates, said plates being individually adapted to control the setting of a musical chord and having each a rigid finger piece disposed in a different position whereby the plates may be independently manipulated, the finger pieces forming virtually a keyboard.

8. A chord control device for stringed instruments of the type having a plurality of strings, each of which may be stopped in various positions to produce a plurality of musical pitches, said device comprising a plurality of string-stopping members, a plurality of independently operable selector means, each of said means being adapted when moved into operative position, to effect the engagement of certain of the said string-stopping members with the strings and at positions required for the stopping of such strings to produce a musical chord, and an automatic locking device for holding at least one of said actuating means in operative position after it has been manually moved to such position, yielding means adapted to restore said actuating means to inoperative position when not held by said locking device, and releasing means adapted to automatically disengage said locking device from the said selector means held in operative position by such device, when another of said selector means is moved into operative position.

9. The chord control device according to claim 7, further characterized in that the said finger pieces are formed integrally with the selector plates.

10. The chord control device according to

claim 7, further characterized in that the said finger pieces are disposed so as to form a keyboard having three substantially parallel rows of keys.

11. A chord control device for stringed instruments, said device comprising a bank of chord selector plates, said plates being arranged in groups such that the length of the plates in any group differs from the length of the plates in the other groups.

12. A chord control device for stringed instruments, said device comprising a bank of superimposed chord selectors, said selectors having a comb-like toothed portion, a plurality of hook rods projecting each through the said bank of selectors and lying within the teeth of the comb-like portion of the selectors.

13. A chord control device for stringed instruments, said device comprising a plurality of chord selectors supported below the finger-board of the instrument, a plurality of string-stops mounted above the said finger-board, and a plurality of members projecting through said finger-board, said members being adapted respectively to transmit motion from the selectors to individual string stops whereby when the selector for a desired chord is actuated, the string stops corresponding to such chord will be set in operative position.

14. The device according to claim 13, further characterized in that said members projecting through the finger-board are pivotally supported by the finger-board.

15. A musical instrument keyboard characterized in that keys controlling various musical chords are arranged in a series and in the following sequence, which sequence constitutes a harmonically closed cycle in either direction, the chords controlled by a key at the upper end of the series bearing the same relation to the chord controlled by a key at the lower end of the series as any chord controlled by one of said keys bears to the chord controlled by the key immediately above it in the series, the said sequence being B, E, A, D, G, C, F, B♭, E♭, A♭, D♭, and G♭.

16. A musical instrument keyboard of the type in which the keys control chords instead of individual notes, said keyboard being characterized in that the chord control keys for a given class of chords are arranged in an invertable consecutive series normally B, E, A, D, G, C, F, B♭, E♭, A♭, D♭, and G♭, each key being adapted to control a chord the root of which has a scale position five or seven half tones higher than the scale position of the root of the chord controlled by the key preceding it in the said series depending upon whether the keys are arranged in the normal series or the inversion of said series, in which latter case the sequence is G♭, D♭, A♭, E♭, B♭, F, C, G, D, A, E, and B.

17. A musical instrument keyboard of the type in which the keys control chords instead of individual notes, said keyboard being characterized in that keys controlling chords of the same class are segregated respectively in separate rows, the keys controlling the said chords in at least two of said rows being arranged respectively in the following sequence, which sequence constitutes a harmonically closed cycle, the chords controlled by a key at the upper extremity of the keyboard bearing the same relation to the chord controlled by a key at the lower extremity of such keyboard as any chord controlled by one of said keys bears to the chord controlled by the key immediately above it in the said sequence, the said sequence being B, E, A, D, G, C, F, B♭, E♭, A♭, D♭, and G♭, the said lines of keys beginning at a key in the sequence given and continuing in either direction through said sequence to and including the key adjacent to the key of beginning.

18. A musical instrument keyboard of the type in which the keys control chords instead of individual notes, said keyboard being characterized in that the keys which respectively control major, dominant seventh and minor chords are arranged in rows, a plurality of keys within each row being arranged in accordance with the consecutive order given in the following invertable sequence: B, E, A, D, G, C, F, B♭, E♭, A♭, D♭, and G♭, the keys of the same letter being substantially opposite each other in the three rows.

19. A musical instrument keyboard of the type in which the individual keys separately control chords instead of individual notes, said keyboard being characterized in that a plurality of keys each controlling harmonically different chords of the same class, are segregated respectively in separate class rows, the keys controlling the said chords of various classes being arranged in their respective rows in the same sequence in regard to scale position.

20. The musical instrument keyboard according to claim 19, further characterized in that keys controlling the major, minor, and dominant seventh chord classes are segregated respectively into separate class rows.

21. A musical instrument keyboard according to claim 19, further characterized in that keys controlling chords of the major, dominant seventh, and minor classes are arranged respectively in parallel rows.

22. A musical instrument keyboard according to claim 19, further characterized in that the keys controlling chords of the same class are arranged in rows commencing with "B" chord keys and ending with G♭ chord keys.

23. A musical instrument keyboard of the type in which the keys control chords instead of individual notes, said keyboard being characterized in that the keys which respectively control major, dominant seventh and minor chords are arranged in rows, and a relatively

smaller number of keys controlling the augmented triads and diminished seventh chords being disposed toward the longitudinal center of the longer rows of keys controlling the major, dominant seventh, and minor chords.

24. A musical instrument keyboard of the type in which the keys control chords instead of individual notes, said keyboard being characterized in that keys controlling at least the major, dominant seventh, and minor chord classes be grouped in separate and substantially coextensive rows, the dominant seventh row of keys lying between the rows of major and minor chord control keys.

25. A musical instrument keyboard of the type in which the keys control chords instead of individual notes, said keyboard being characterized in that 43 chord control keys are segregated into five different class groups of chord control keys, said groups comprising respectively a group of 12 major chord keys, a group of 12 dominant seventh chord keys, a group of 12 minor chord keys, a group of 4 augmented triad keys, and a group of 3 diminished seventh keys.

26. A musical instrument keyboard of the type in which the keys control chords instead of individual notes, said keyboard being characterized in that the chord control keys for major, minor, and dominant seventh chords are arranged in rows, each key in said rows being adapted to control a chord having a scale position five half tones higher than the scale position of the chord controlled by the key preceding it in the same row.

27. A musical instrument keyboard of the type in which the keys control chords instead of individual notes, said keyboard being characterized in that a row of keys controlling the dominant seventh chords is disposed between two rows of keys controlling respectively the major chords and minor chords.

28. A chord control device for stringed instruments, said device including a plurality of independently operable string-stopping means and a plurality of longitudinally-slidable selector plates, said plates being variously formed to actuate different combinations of said independently operable string-stopping means whereby the instrument strings may be automatically stopped to produce a variety of musical chords by the successive manipulation of said selector plates.

29. A chord control device according to claim 28, further characterized in that the said selector plates are stacked in a compact bank, said plates having a plurality of normally registering through openings, through which openings movable parts of said string-stopping means are adapted to project, and in which openings said means are normally free to be moved into operative or inoperative position, and said plates being each further provided with at least one string stop actuating part adapted, when the plate is moved from its normal inoperative position, to actuate the corresponding string-stopping means.

30. A chord control device according to claim 28, further characterized in that said selector plates are differently formed and each individually provided with one or more string stop actuating parts, which parts are each adapted to move certain of said string-stopping means to set up the particular chord for which each selector plate is adapted, and said selector plates being formed to permit their being independently moved from inoperative to operative position without actuating any of said string-stopping means save the particular means required for the production of the individual chord set-up for which each of said plates is adapted.

31. A chord control device for stringed instruments including a plurality of string-stopping means, a plurality of manually operable string stop selectors, each of said selectors being adapted in cooperation with certain of said string-stopping means to effect, when moved to operative position, the stopping of the instrument strings appropriate for the production of a given chord, locking means adapted to automatically lock certain of the string-stopping means in operative engagement with the instrument strings after such engagement has been effected by the manual actuation of a selector, automatic releasing means adapted to disengage said locking means whereby to free the locked string-stopping means controlled by a given selector, upon the subsequent actuation of another selector, and resilient restoring means adapted to return the selectors to inoperative position.

32. A chord control device according to claim 31, further characterized in that the said selectors each comprise a plate, said selector plates being arranged in a compact bank and being adapted to freely slide one with respect to another, and said selector plates being each provided with an actuating key, the said key of each plate being removed a sufficient distance from the keys of the other plates to permit of ready access for the independent manual actuation of each of said keys.

33. A chord control device according to claim 31, further characterized in that the said selectors each comprise a plate, the locking means therefor comprising a detaining surface on each plate and a detent mounted on a fixed part of the device, said detent being adapted to automatically move into engagement with such detaining surface of a selector plate, as said plate is moved into operative position, and the unlocking means for said selectors comprising a cam surface on each of said selector plates adapted, upon the movement of a selector plate into operative position, to move the said detent out of en-

gagement with the detaining surface of a selector plate previously locked by said detent.

34. A chord control device for stringed instruments, said device comprising a frame supported beneath the neck of the instrument, a plurality of superimposed longitudinally slidable chord selector plates guided within said frame, said selector plates having a plurality of slots, the said slots of the several plates being superimposed in transverse registration, hook rods with downwardly-projecting hook portions, said hook portions lying one within each of said slots, a plurality of pivotally supported string stops adapted to be severally moved by said hook rods into engagement with the instrument strings, springs cooperating with said string stops adapted to move said stops out of engagement with the instrument strings and thereby to restore the selector plates to inoperative position, each of the said selector plates being characterized by an individual arrangement of hook-rod actuating parts, said parts being disposed in certain of the slots of each plate whereby to actuate the hook rods appropriate to the production of a particular chord, and a plurality of spaced finger pieces each connected to a selector plate and arranged to form a keyboard whereby the said plates may be individually and selectively moved into operative position by manual control.

35. A chord control device according to claim 34 further characterized in that each of the said selector plates is provided with a shoulder, and a detent adapted to engage such shoulder when a selector plate is moved into operative position.

In witness whereof, I have hereunto signed my name.

JOHN MOKREJS.