Sept. 29, 1931. M. B. LUTTBEG 1,825,407

ACCORDION

Filed Jan. 26, 1931 4 Sheets-Sheet 1

Fig. 1.

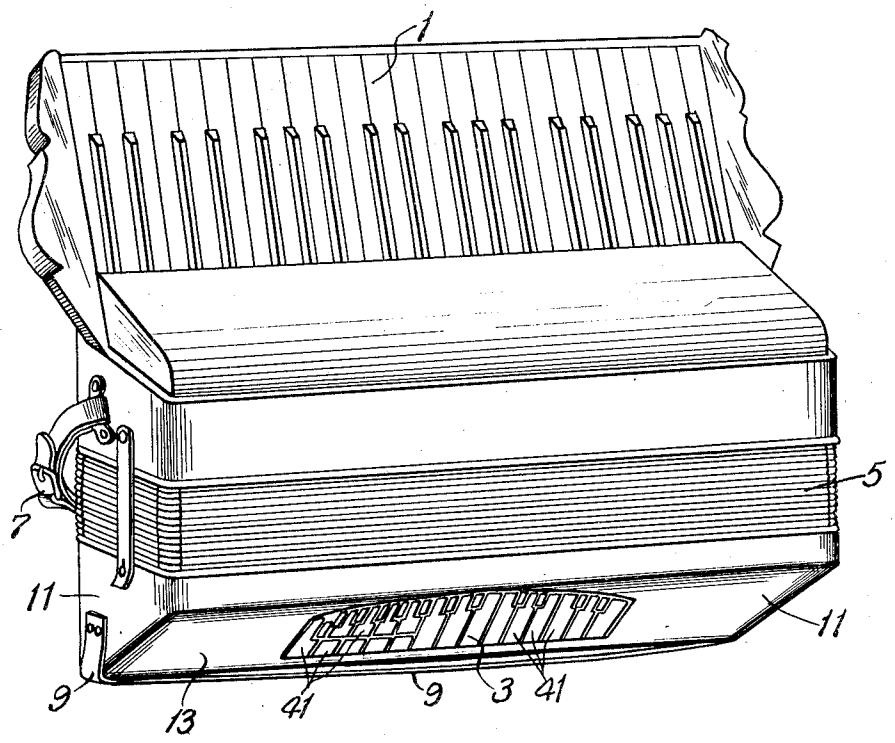
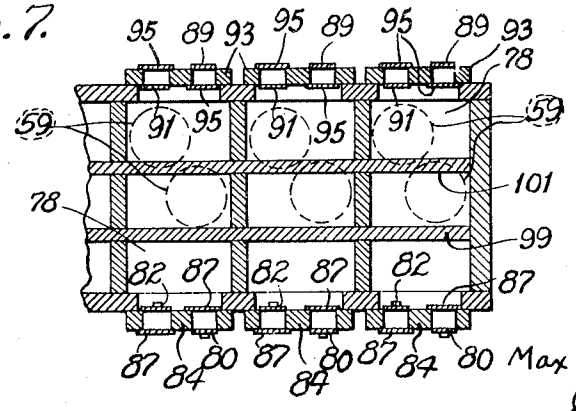


Fig. 7.



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ACCORDION

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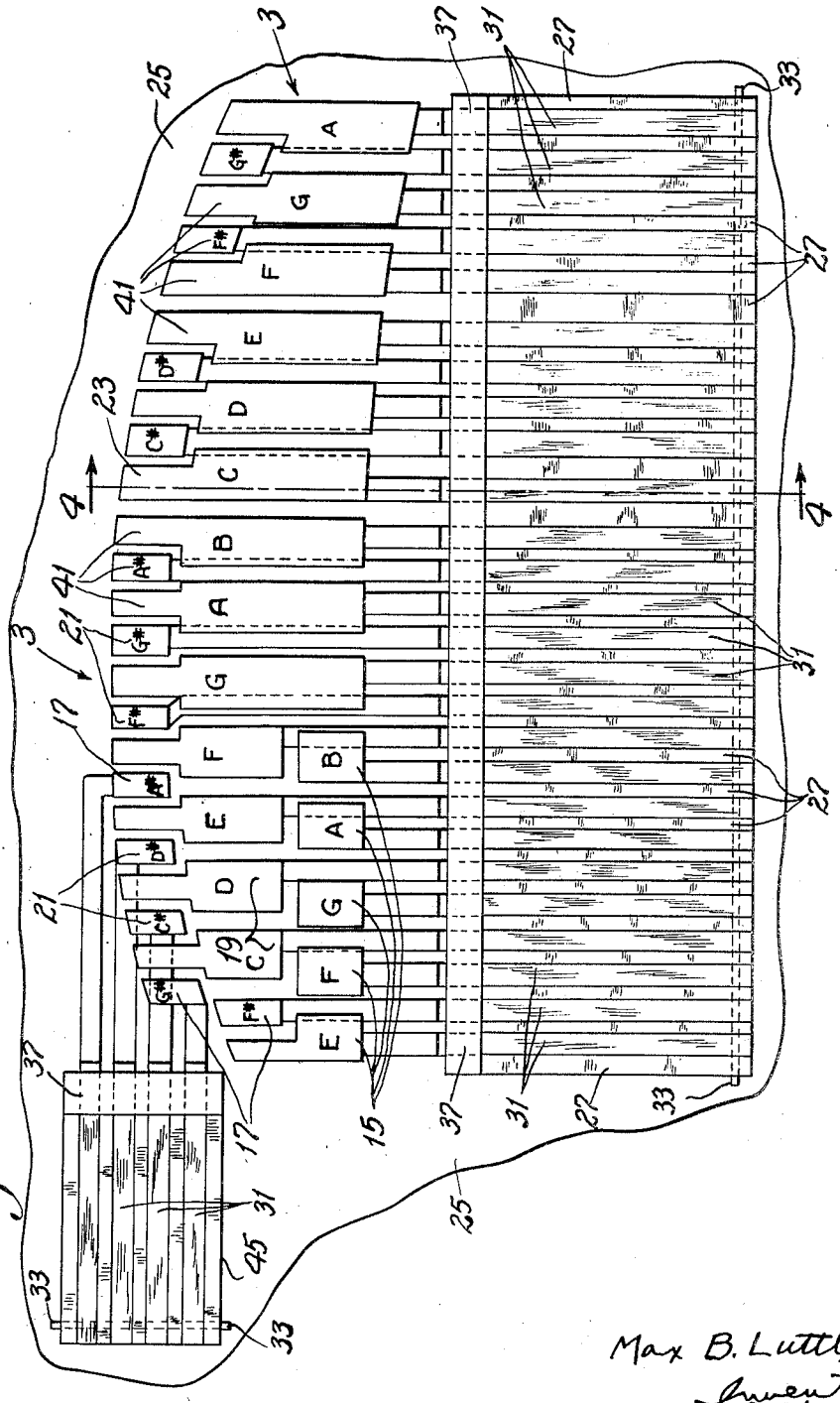


Fig. 2.

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ACCORDION

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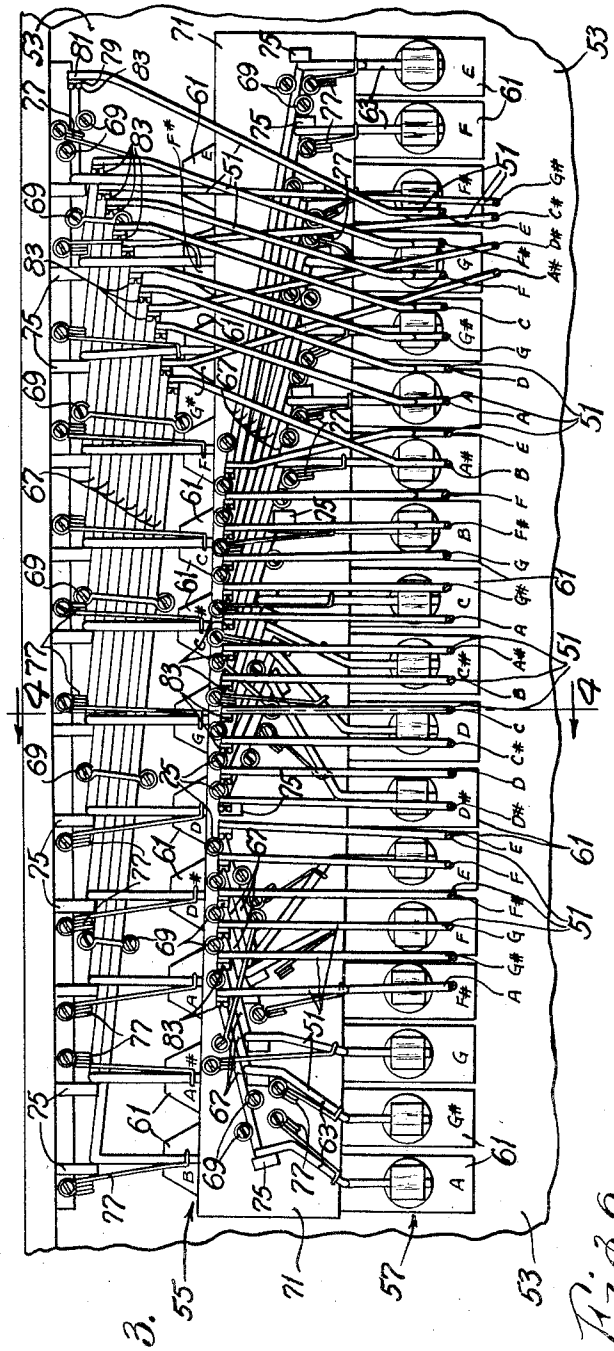


Fig. 3.

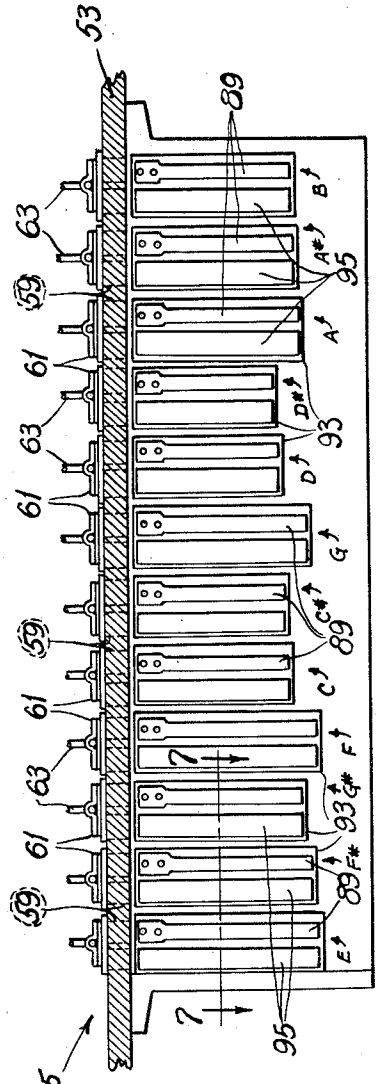


Fig. 6.

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Fig. 4.

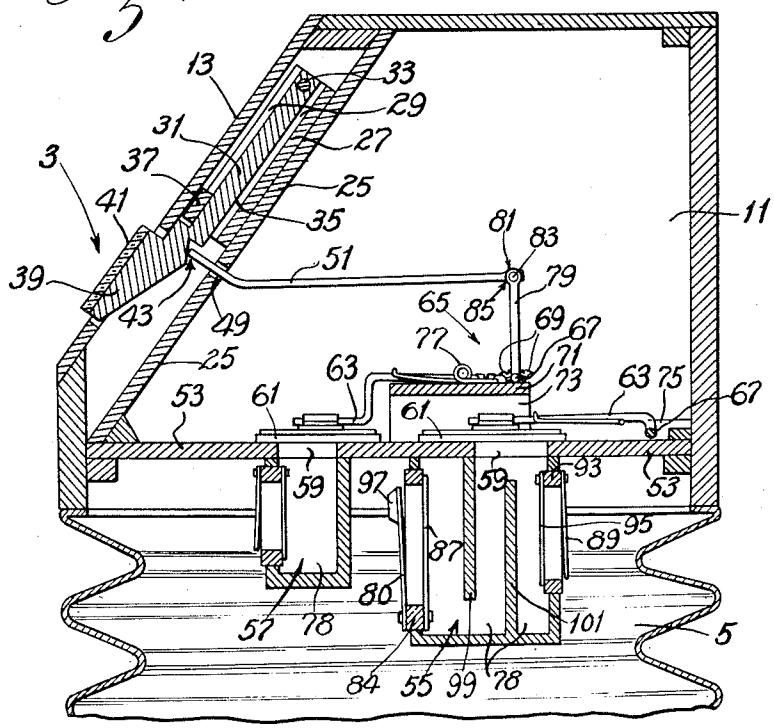
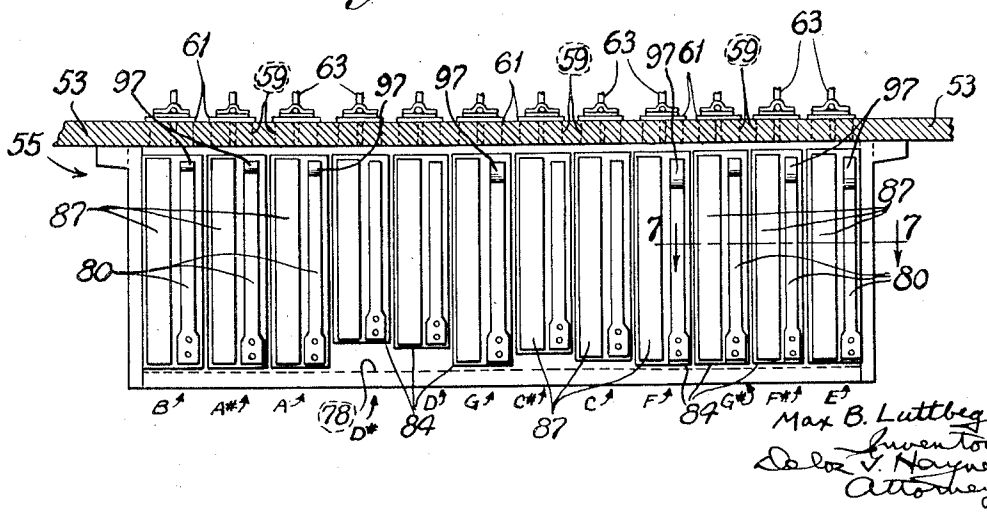


Fig. 5.



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UNITED STATES PATENT OFFICE

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ACCORDION

Application filed January 26, 1931. Serial No. 511,134.

This invention relates to musical instruments, and with regard to certain more specific features, to musical instruments of a pneumatic, vibrating reed character, for example, accordions.

Among the several objects of the invention may be noted the provision of a musical instrument of the class described wherein the total range is divided into treble and bass sections, and wherein both treble and bass sections are provided with keys arranged for individual operation of single notes arranged in chromatic scales; an instrument wherein the single note keys of the bass section are arranged in a keyboard permitting quick and ready change between notes; an instrument wherein the bass keyboard includes a maximum number of single-note keys within the span of an ordinary hand, yet which is free from the disadvantages of excessive narrowness of individual keys; an instrument having a bass keyboard arranged to permit the easy formation of a substantially unlimited number of chords from the single-note keys, and which is likewise adapted for direct playing from piano scores and the like, without necessitating special transpositions; the provision, in a musical instrument of the class described, of an improved form of mechanical linkage between keys and reed-controlling clappers; and the provision, in a musical instrument of the class described, of an improved reed arrangement whereby richer and fuller tones are obtained with attendant reduction of extraneous undesirable noises. Other objects will be in part obvious and in part pointed out hereinafter.

The invention accordingly comprises the elements and combinations of elements, features of construction, and arrangements of parts which will be exemplified in the structure hereinafter described, and the scope of the application of which will be indicated in the following claims.

In the accompanying drawings, in which is illustrated one of various possible embodiments of the invention,

Fig. 1 is a trimetric view of an accordion;

Fig. 2 is a plan view of the bass keyboard of the accordion of Fig. 1, a cover plate having been removed;

Fig. 3 is a plan view of the clapper chamber of the accordion of Fig. 1;

Fig. 4 is a vertical ideal section taken substantially on line 4—4 of Figs. 2 and 3;

Fig. 5 is a left-side elevation of a row of reed chambers shown in Fig. 4;

Fig. 6 is a right-side elevation of the row of reed chambers of Fig. 5; and,

Fig. 7 is a horizontal cross-section taken on line 7—7 of Figs. 5 and 6.

Similar reference characters indicate corresponding parts throughout the several views of the drawings.

Referring now more particularly to Fig. 1, there is illustrated an accordion having in general an outward appearance similar to the usual accordion. As is customary with accordions of this general classification, the range of notes is divided into two sections, comprising a treble section and a bass section. The notes of the treble section are manipulated by means of a piano keyboard 1. The notes of the bass section are manipulated by means of a second keyboard 3. A customary bellows 5 is provided. A suitable shoulder strap 7 and a hand strap 9, are likewise provided.

With the construction of the treble keyboard 1 and the mechanical connection thereof to the usual reeds producing the musical notes, the present invention is not concerned. For the purposes of the present invention, it may be presumed that the treble keyboard 1 and the notes or reeds connected thereto are formed in a manner customary in the accordion art.

Confining the description, accordingly, to the bass side of the accordion, it will be seen that it comprises a box 11, to which is secured the bellows 5, and which has arranged thereon a sloping panel or face 13. Centrally disposed in the panel 13 is the second, bass keyboard 3. The general arrangement of keys on the bass keyboard 3 will be seen more particularly in Fig. 2.

With prior art forms of accordions, the bass section has comprised a large number of buttons, each of which instead of producing

a pure tone acted to produce a chord of several tones. The use of the bass section of such accordions was accordingly limited to a predetermined number of chords, as determined by the number of buttons. The disadvantages of such construction are many. The formation of unusual chords, such as are required in modern musical compositions, as well as in the more advanced classical compositions, is impossible. It is necessary to make a separate transportation of the customary musical score for each composition, in order that the bass accompaniment on the accordion might be regulated to the capability of the accordion itself.

The use of a large piano kyeboard on the bass side of the accordion identical to the treble keyboard 1 is considered highly objectionable, because the hand which plays the bass section must also pump the bellows. In order suitably to secure the hand to the bass section in order to pump the bellows 5, a strap 9 is used. The strap 9, engaging say the right hand, prevents movement of the hand sidewardly to such an extent that it is impossible to effectively manipulate a range of keys of the type of the treble keyboard 1.

In the present invention, the above difficulties are overcome by the establishment, in the bass section of the accordion, of a chromatic keyboard 3, which keyboard 3 is so designed as to present within a single human hand span a maximum number of single-tone keys. In the present embodiment of the invention, thirty separate tones and twelve additional compounded tones are contained in the bass keyboard 3. The keyboard 3 is arranged so that these tones or notes are in chromatic sequence. It will be seen that the keyboard 3 permits of the formation of an unlimited number of chords, and, further, that it likewise permits of direct playing from an ordinary piano score, without necessitating special transpositions.

The arrangement of the several keys on the keyboard 3 will be apparent by inspection of Fig. 2. The lowest tone, on the left-hand side of the keyboard 3, is the third E natural below middle C, compounded with the second E natural below middle C. This lowest E is compounded with its next higher octave in order to secure, for accompaniment purposes, a sub-bass or a basso profundo. Proceeding to the right from low E, the succeeding natural notes or single tones F, G, A and B are presented as relatively small, square keys 15. For distinguishing purposes, these low notes or sub-bass notes are colored green, for example, in order to distinguish them from the remainder of the keyboard, which is arranged in black and white simulating the keyboard of a piano.

The half notes for the sub-bass range, comprising F#, G# and A#, are presented as small keys indicated by numeral 17. These keys 17 are preferably colored similarly to the keys 15.

The next tone above the sub-bass B key 15 is C, representing the left-hand key of the main keyboard, the natural note keys of which are indicated by numeral 19, and the half note keys of which are represented by numeral 21. The main keyboard natural keys 19 are preferably white, and the half note keys are preferably black, in order to correspond with the keyboard of a piano. Commencing with the C just mentioned, the main keyboard keys 19 and 21 proceed in chromatic sequence, to the right, in typical piano keyboard arrangement. Numeral 23 indicates the key 21 of the natural solo tone, middle C.

From the low E (15) key in the sub-bass range, through the first D sharp (21) key of the main keyboard, the associated tones are compounded single tones as indicated hereinbefore. That is, each key represents compounded reeds for producing two vibrations an octave apart. The purpose of this arrangement is to secure, in the lowermost ranges of the accordion, a deep, resonant bass for accompaniment purposes. In diatonic sequence, the keys which are thus compounded are: E (15), F (15), F# (17), G (15), G# (17), A (15), A# (17), B (15), C (19), C# (21), D (19), and D# (21), a total of twelve. It will be understood that the term "single tone" as used herein includes the compound tones in the sub-bass range, "single tone" being used in the sense of representing solo vibrations and octaves thereof, in contradistinction to chords, or mixed tones, such as produced in prior art accordions.

The remainder of the keys on the keyboard 3 represent pure or solo single tones. The lowest pure tone is represented by the left-most E key 19. This E is the first E below middle C, and is accordingly one octave above the higher E of the lowest compound E key 15. The highest note of the keyboard 3, and accordingly the highest note of the bass section of the accordion, is the right-most A key 19, which represents the first A above middle C.

It is thus seen that the entire range of the keyboard 3 includes forty-two solo tones of which twenty-four are controlled by the compound sub-bass keys, from E to D# and the remaining eighteen are controlled by the solo bass keys, from E to A.

It is likewise seen, from a structural standpoint, that the keyboard 3 resembles a piano keyboard having the lower portions thereof doubled over to include a larger number of keys within restricted space. As has been indicated before, the keys 15 and 17 are preferably colored green in order to distinguish them from the white keys 19 and the black keys 21. Also to facilitate playing, the

relative height of the various keys is preferably arranged in the following manner: The white keys 19 are preferably at normal playing level, for example, three-sixteenths of an inch above the panel 13. The green keys 15 are preferably arranged about an eighth of an inch below the white keys 19. The green keys 17 and the white keys 21 preferably extend in the order of one-eighth inch above the white keys 19. All of the keys are preferably separated from each other by spaces which will permit an ordinary human finger to depress one key to the exclusion of the sidewardly adjacent keys. Such a spacing, for example, is shown in Fig. 2.

It is to be understood, of course, that colors other than green, white and black may be used, the idea of the color being to distinguish the various classes of keys, and the particular colors being themselves of little consequence.

The mechanical construction of the keyboard 3 will be apparent from Figs. 2 and 4. In Figs. 2 and 4, numeral 25 represents a keyboard base panel, which forms one face of the box 11 and is positioned similarly to the panel 13 (see Fig. 1). Secured to the base panel 25 is a lever-supporting board 27. The board 27 has cut therein a number of parallel slots 29 (see Fig. 4).

Each of the keys of the keyboard 3 is affixed, individually, to a separate lever 31. The levers 31 are of suitable thickness to move freely in the slot 29. The levers 31 are held on the board 27, in the slots 29, by means of a pin or fulcrum bar 33.

By reference to Fig. 4, it will be seen that the lever 31 has a sloping bottom as indicated at numeral 35. The sloping bottom 35 permits the lever 31 to be depressed in the slot 29 of the board 27, rotating about the pin 33 as a fulcrum. A stop bar 37 limits the upward movement of the levers 31 in the slot 29. The front portion of each lever 31 is suitably raised as at numeral 39 to support the keys at their respective proper heights as indicated hereinbefore. The keys 15, 17, 19 and 21 per se comprise suitably shaped pieces 41 of material such as celluloid, bakelite or the like, mounted on the raised portion 39 and secured thereto by glue or other similar means. It is to be understood that the shape of the pieces 41 depends upon the shape of the indvidual keys, and that it is not necessary that said pieces 41 be shaped to conform to the upper surface of the lever 31.

On the under side of each lever 31 is formed a notch 43, having a sloping front edge. The notch 43 serves to connect the levers 31 to the reed operating mechanism as will be described hereinafter.

In the present embodiment all except four of the keys 15, 17, 19 and 21 operate in the board 27. The four keys G# (17), A# (17), low C# (21) and low G# (21) operate in a separate key-supporting board 45, disposed at right angles to the main key supporting board 27. In construction, the key supporting board 45 is similar to the board 27, and the levers 47 provided for the board 45 are mechanical equivalents of the levers 31 in the board 27. The function of the separate board 45 and levers 47 is to facilitate connection from the key to the reed operating mechanism.

It is to be understood that the separate lever supporting boards 27 and 45 described above are the desirable manner of carrying out my invention. It is within the scope of the invention, however, to mount all of the keys on a single board, whereby the key levers all work in a parallel manner. In such an instance, the board 45 would become a part of the board 27, and the levers 47 would become similar to and parallel with the levers 31.

Beneath each of the keys 31, in a location determined by the location of the notch 43, there is formed in the base board 25 an opening 49, which permits the passage of a connecting rod 51.

The reed operating mechanism per se is illustrated in Figs. 3 and 4. At numeral 53 is indicated a clapper board which is supported by the box 11. On the side of the board 53 facing the bellows 5, are mounted, in parallel rows 55 and 57, the tone-producing reeds. The method of mounting the reeds will be described more in detail hereinafter. Openings 59 in the clapper board 53 permit individual communication with the various reeds and reed compounds.

The row 55 includes the twenty-four solo tones described hereinbefore as the compound sub-bass tones. Inasmuch as each key controls a single compound tone comprising two solo tones spaced an octave apart, there are but twelve reed chambers in the row 55, which determines the number of openings 59 at twelve likewise. The sequence of tones in the row 55, from left to right in Fig. 3, is: B, A#, A, D#, D, G, C#, C, F, G#, F#, E. Thus a chromatic octave is provided for in said row 55.

The row 57 includes the 18 remaining single solo tones described hereinbefore as the pure bass tones. Eighteen openings 59 are provided for the reed chambers producing these eighteen tones. The arrangement is in natural tonal sequence, ranging, from left to right in Fig. 3, from the A above middle C to the E below middle C, a chromatic octave and a half.

Covering the upper side of each opening 59 of the rows 55 and 57 is a clapper 61, which functions as a valve to permit ingress and egress of air to and from the respective reed chamber concerned. The clappers 61 are formed of any suitable material, such as wood with a felt backing. Attached to each

clapper 61 is a clapper arm 63, which constitutes one extension of a three dimensional bell-crank lever 65. The central portion 67 of said bell-crank lever 65 forms a bearing for said lever 65. The portions 67 of the levers controlling the clappers 61 in row 55 are rotatably mounted directly on the clapper board 53 by means of screw and washer assemblies 69 (see Fig. 3). The portions 67 of the levers controlling the clappers 61 in row 57 are rotatably mounted in a similar manner on a platform 71 supported above the clappers in row 55, on the clapper board 53, by suitable end pieces 73. Blocks or screws 75 are provided for preventing endwise motion of the levers 65 on both the clapper board 53 and the platform 71.

Coil springs 77 are mounted adjacent each arm 63 and serve to hold said clappers 61 normally in closed position against the holes 59.

The third arm 79 of each bell crank lever 65 extends substantially perpendicularly to the clapper board 53 or the platform 71, as the case may be, and is flattened at its upper end 81. This flattened upper end 81 of the arm 79 is attached, by a machine screw 83 or the like, to a similarly flattened end 85 of the rod 51 extending to the notch 43 in the key lever 31.

It will be apparent from the foregoing that depression of a key piece 41 moves the rod 51 to operate the bell-crank lever 65 and lift the clapper 61 against the reaction of the spring 77, thus producing the musical tone desired, assuming, of course, the establishment of a pneumatic pressure with the bellows 5 in the customary manner. Upon releasing pressure on the key piece 41, the spring 77 immediately closes the clapper 61, and simultaneously moves the end of the rod 51 to return said key piece 41 to its normal position (with the lever 31 against the stop bar 37).

The free, lost-motion engagement between the end of the rod 51 and the notch 43 in the lever 31 permits a degree of motion of said rod 51 independently of the lever 31. Also, said notch 43 assures the complete return of the rod 51 to normal position, and thus the clapper 61 to fully closed position, regardless of small changes in length and the like in the various elements which might be occasioned by changes of humidity, temperature, etc.

The reed chambers 78 forming the rows 55 and 57 are shown more in detail in Figs. 4, 5, 6 and 7. In the row 55 (see Figs. 5, 6 and 7), each chamber 78 is provided at one side with a pair of reeds of the same tone 80 and 82, mounted in a reed plate 84. The reeds 80 and 82 are mounted on opposite sides of the plate 84. A closing piece or flapper 87 is provided for each reed, and is, respectively, mounted on the reed plate 84 opposite the side occupied by the reed. The purpose of this arrangement is to provide one reed (in this case, 80) to operate with motion of air from the bellows 5 into the chamber 78, and one reed (82) to operate with motion of air to the bellows 5 from the chamber 78, whereby the desired tone may be secured at any time regardless of the direction of motion of the bellows 5.

Since the row 55 of chambers 78 represents the compound sub-bass range of the accordion, and each chamber 78 is adapted to produce a single tone comprising two solo tones separated by an octave interval, each chamber 79 of the row 55 is provided with a second pair of reeds 89 and 91 mounted in a reed plate 93 on the opposite side of the chamber 79 from the reed plate 85. The reeds 89 and 91 are tuned to vibrate one octave higher than the reeds 81 and 83, and are arranged to operate alternately, on intake and exhaust, in the same manner as reeds 80 and 82. Flappers 95 are provided for the reeds 89 and 91 and are similar to the flappers 87.

It is impractical in an accordion of the type illustrated to effect the lowermost solo tones, represented by part or all of the reeds 80, 82, by lengthening said reeds to a degree sufficient to achieve the necessary low frequency of vibration, as such a procedure would result in the use of reeds too long to fit in the collapsed bellows 5. For this reason, all of the reeds 80, 82 below low D (in the present embodiment) are made the same length, and the frequency of vibration is controlled by positioning varying amounts of a weighting material 97, such as lead or solder, on the free-moving ends of the reeds. Thus, the reeds corresponding to the lowest solo note of the accordion range, E, have the most weighting material 97 (see Fig. 5), and the longest vibratory period.

A disadvantage of the added weight method of controlling the vibratory period of the lower reeds lies in the fact that a reed so weighted has a higher vibrational inertia than a clean reed, and it is thus more difficult to set such a weighted reed in harmonic operation with the pneumatic pressure set up by the bellows 5 to produce the desired solo tone. In fact, such weighted reeds, mounted in the manner of the prior art, are frequently observed to "click" or "cluck", without vibrating to produce the desired tone.

I have discovered that such a failure to vibrate is largely occasioned, in the prior art form of mounting, by a choking effect set up in the short column of air in the chamber 78, and is enhanced by the air-damping effect of the vibrating octave reeds 89 and 91.

I have further discovered that the customary manner of mounting reeds, free end downward, as typified by the mountings of reeds 89 and 91, is not conducive to the production of the best tone quality from the low reeds 81, 83.

In order to overcome the above-noted un-

desirable effects and arrange for free, clear, easily-produced vibration in the reeds 80, 82, I have shown a novel manner of mounting the reeds 80 and 82, for the lowermost tones of the accordion. Briefly, this novel manner of mounting comprises the formation, in the chamber 78, of a lengthened air column for the reeds 80, 82, the establishment of a baffle whereby air damping occasioned by the corresponding vibrating octave reeds 89, 91, is prevented from contacting with the reeds 80, 83, and the reverse mounting of the reeds 81, 82, whereby their free ends are at the upper end, rather than at the lower end as is customary in the art.

The lengthened air column is provided by a baffle 99 extending, in the chamber 79, downward from the clapper board 53 (see Figs. 4 and 7). Thus the air column from the clapper 61 to the reeds 80, 82, is effectively double the depth of the chamber 79. A second baffle 101 extending upward from the bottom of the chamber 78 serves to prevent damping waves from the octave reeds 89, 91, from hitting the reeds 80, 82. The baffle 101 likewise assists in the establishment of a definite air column for the reeds 80, 82. The reed plate 84 for the reeds 80, 82 is inverted and mounted, otherwise in the usual manner, on the chamber 78 with the free ends of the reeds 80, 82 up.

It is to be noted that the above description of the reason for which the lengthened air column and reversed mounting of the lowermost reeds is effected, is by way of explanation only. The fact is that mounting in the manner described clarifies and intensifies the tone produced, and also enhances its quality. The explanation of the phenomena which occasion this improvement may be other than that given and at present unknown to me.

It is also to be noted that the improved manner of mounting described above may be applied to a larger or smaller number of reeds than as illustrated. For example, in accordions having an extraordinarily low range, the improved mounting may be used with marked success on all of the reeds in the entire bass section.

The row 57 of reed chambers, comprising the solo bass single tones, is formed in the manner customary in the art and accordingly requiring no further description herein. It is to be understood, however, that if these solo bass tones are sufficiently low to warrant it, the improved mounting of the reeds 80, 82 may be utilized for the reeds of the row 57.

In view of the above, it will be seen that the several objects of the invention are achieved and other advantageous results attained.

As many changes could be made in carrying out the above constructions without departing from the scope of the invention, it is intended that all matter contained in the above description or shown in the accompanying drawings shall be interpreted as illustrative and not in a limiting sense.

I claim:

1. In a musical instrument of the class described, a series of reeds for producing tones and a pair of keyboards for operating said reeds, one of said keyboards controlling the higher tones in single tonal sequence, and the other of said keyboards controlling the lower tones in single tonal sequence, at least one of said keyboards being in width substantially equal to the span of a human hand, said keyboards each simulating in arrangement of keys the beyboard of a piano.

2. In an accordion, a bass section comprising a series of reeds in chromatic sequence, said reeds being disposed in chambers whereby they are operable to produce single tones, and a keyboard comprising a series of keys, each of said keys being mechanically connected individually to open and close one of said chambers, said keyboard being in width substantially equal to the span of a human hand, said keys being spaced from each other a distance suitable to permit manipulation of one of said keys by a human finger without at the same time manipulating the keys adjacent thereto, said keyboard simulating in arrangement of keys the keyboard of a piano.

3. In an accordion, a bass section, said bass section including solo bass single tone-producing reeds and compound sub-bass single tone-producing reeds, and a keyboard comprising individual keys for controlling said reeds to produce single solo bass tones and single compound sub-bass tones, said sub-bass reeds including at least one reed and a second reed adapted to vibrate at an interval of one octave from said first reed, said keyboard being in width substantially equal to the span of a human hand.

4. In an accordion, a bass section comprising a sequence of reeds, said sequence including groups of two reeds for each interval in a chromatic sequence, each of said groups of two reeds being paired for pressure and suction operation, a series of reed chambers, said groups of two reeds being disposed individually in said chambers, and at least a portion of said chambers including more than one group of two reeds, such groups of two reeds in excess of one group of two reeds in one chamber bearing an octave relationship to the other group in said one chamber, and a keyboard comprising individually operable keys, each of said keys cooperating with one of said chambers to control the vibration of the reeds therein, said keys being arranged in said keyboard in such order that they represent reeds in chromatic sequence.

5. In an accordion, a bass section comprising a sequence of reeds, said sequence including groups of two reeds for each interval in a chromatic sequence, each of said groups of

two reeds being paired for pressure and suction operation, a series of reed chambers, said groups of two reeds being disposed individually in said chambers, and at least a portion of said chambers including more than one group of two reeds, such groups of two reeds in excess of one group of two reeds in one chamber bearing an octave relationship to the other group in said one chamber, and a keyboard comprising individually operable keys, each of said keys cooperating with one of said chambers to control the vibration of the reeds therein, said keys being arranged in said keyboard in such order that they represent reeds in chromatic sequence, said keyboard being in width substantially equal to the span of a human hand.

6. In an accordion, a bass section comprising a sequence of reeds, said sequence including groups of two reeds for each interval in a chromatic sequence, each of said groups of two reeds being paired for pressure and suction operation, a series of reed chambers, said groups of two reeds being disposed individually in said chambers, and at least a portion of said chambers including more than one group of two reeds, such groups of two reeds in excess of one group of two reeds in one chamber bearing an octave relationship to the other group in said one chamber, and a keyboard comprising individually operable keys, each of said keys cooperating with one of said chambers to control the vibration of the reeds therein, at least a portion of said keys being disposed at an angular relationship to the remainder of said keys.

7. In an accordion, a reed chamber including a first group of two reeds, said two reeds being disposed in relationship to each other such that one of said two reeds is operated by the flow of air in one direction and the other of said two reeds is operated by the flow of air in the reverse direction, and a second group of two reeds disposed with relation to each other in a manner similar to said first group of two reeds, said second group of two reeds vibrating in octave relationship to said first group of two reeds, said chamber being formed whereby the air column therein for the lower of said two groups of two reeds is longer than the air column therein for the higher of said groups.

8. In an accordion, a reed chamber including a first group of two reeds, said two reeds being disposed in relationship to each other such that one of said two reeds is operated by the flow of air in one direction and the other of said two reeds is operated by the flow of air in the reverse direction, and a second group of two reeds disposed with relation to each other in a manner similar to said first group of two reeds, said second group of two reeds vibrating in octave relationship to said first group of two reeds, the lower of said two groups of reeds being mounted so that the free, vibrating ends of the reeds of that group are oppositely positioned with relation to the vibrating ends of the reeds of the higher of said two groups.

9. In an accordion, a reed chamber including a first group of two reeds, said two reeds being disposed in relationship to each other such that one of said two reeds is operated by the flow of air in one direction and the other of said two reeds is operated by the flow of air in the reverse direction, and a second group of two reeds disposed with relation to each other in a manner similar to said first group of two reeds, said second group of two reeds vibrating in octave relationship to said first group of two reeds, said chamber including a baffle between said two groups of reeds.

10. In an accordion, a bass section comprising single-tone-producing reeds, and a keyboard for individually manipulating said reeds, said keyboard simulating in arrangement of keys the keyboard of a piano, but being substantially entirely operable from a single arm position of the operator while pumping the accordion.

11. In an accordion, a bass section comprising single-tone-producing reeds, and a keyboard for individually manipulating said reeds, said keyboard simulating in arrangement of keys the keyboard of a piano, but being substantially entirely operable from a single arm position of the operator while pumping the accordion, and the individual keys of said keyboard being spaced apart at such intervals that the fingers of the operator do not appreciably overlap adjacent keys.

In testimony whereof, I have signed my name to this specification this 21st day of January, 1931.

MAX B. LUTTBEG.