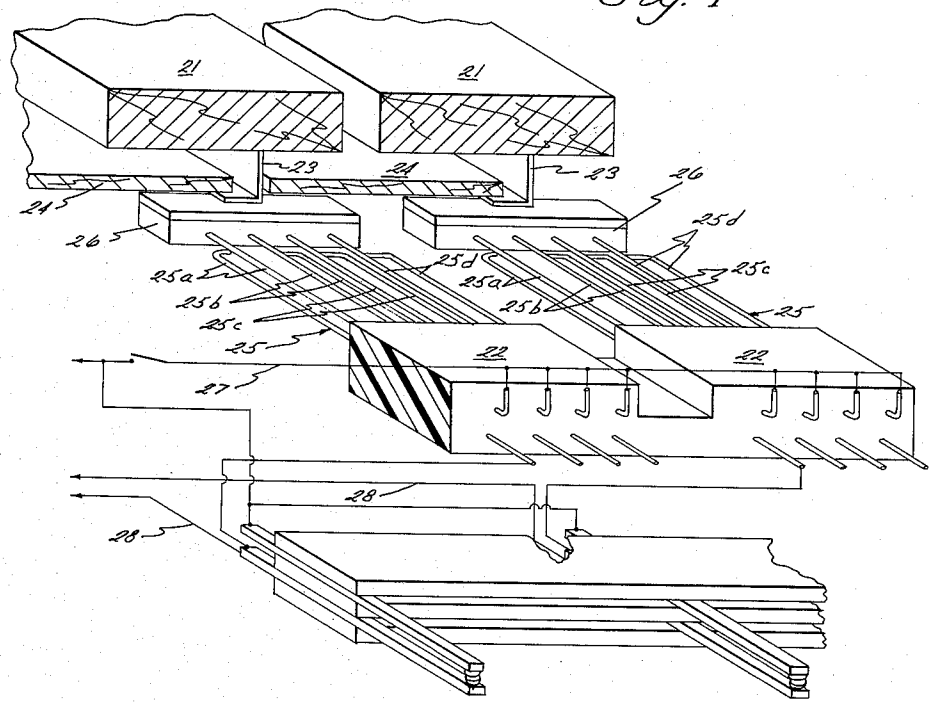
Sept. 26, 1961 J. A. GREIF 3,001,432

ATTACHMENT FOR AUTOMATICALLY PLAYING ROOT TONES OF CHORDS IN BASS SECTION OF ORGAN

Filed Aug. 12, 1957 3 Sheets-Sheet 1

Fig. 1



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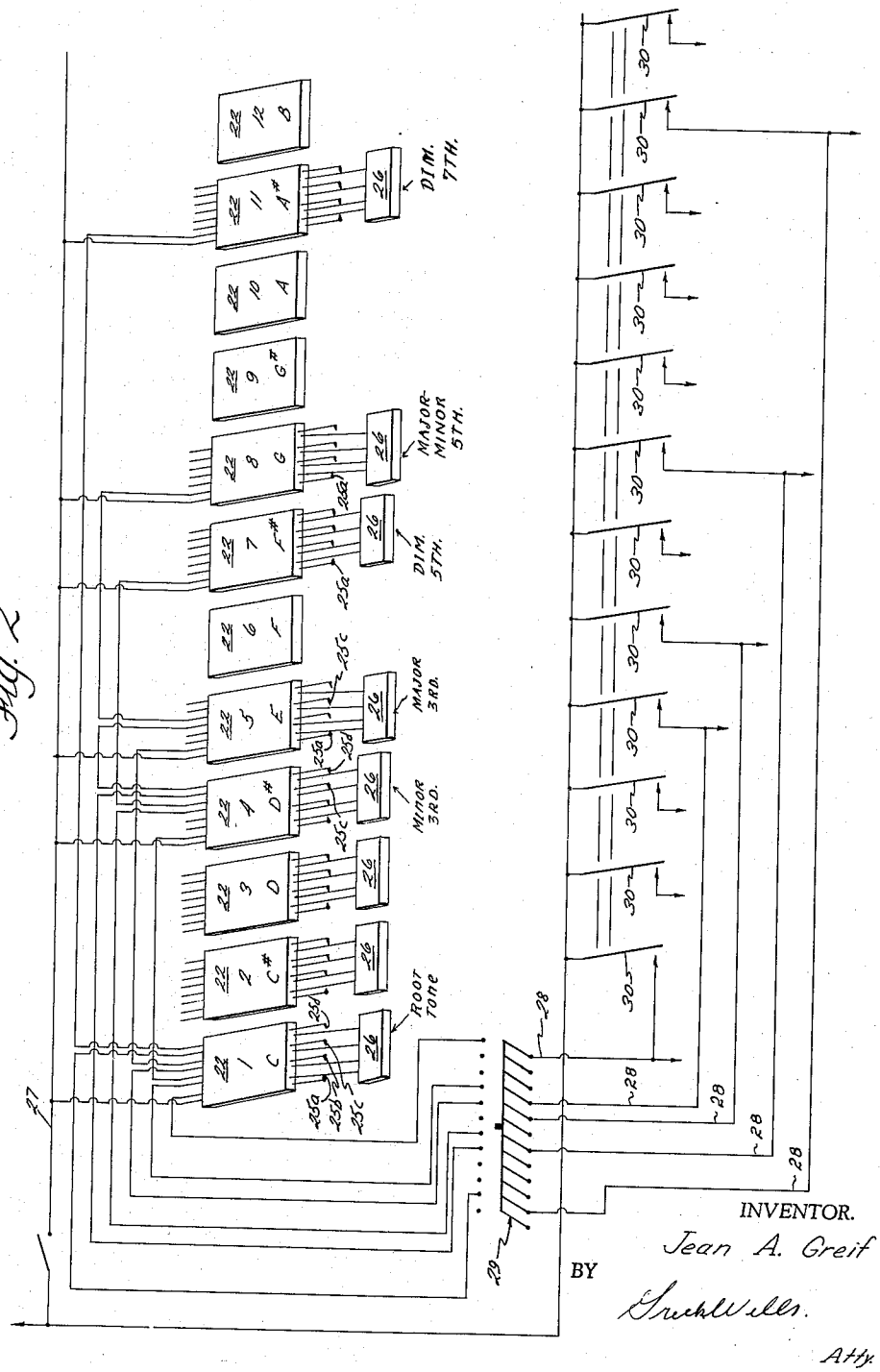


Fig. 2

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Filed Aug. 12, 1957 3 Sheets-Sheet 3

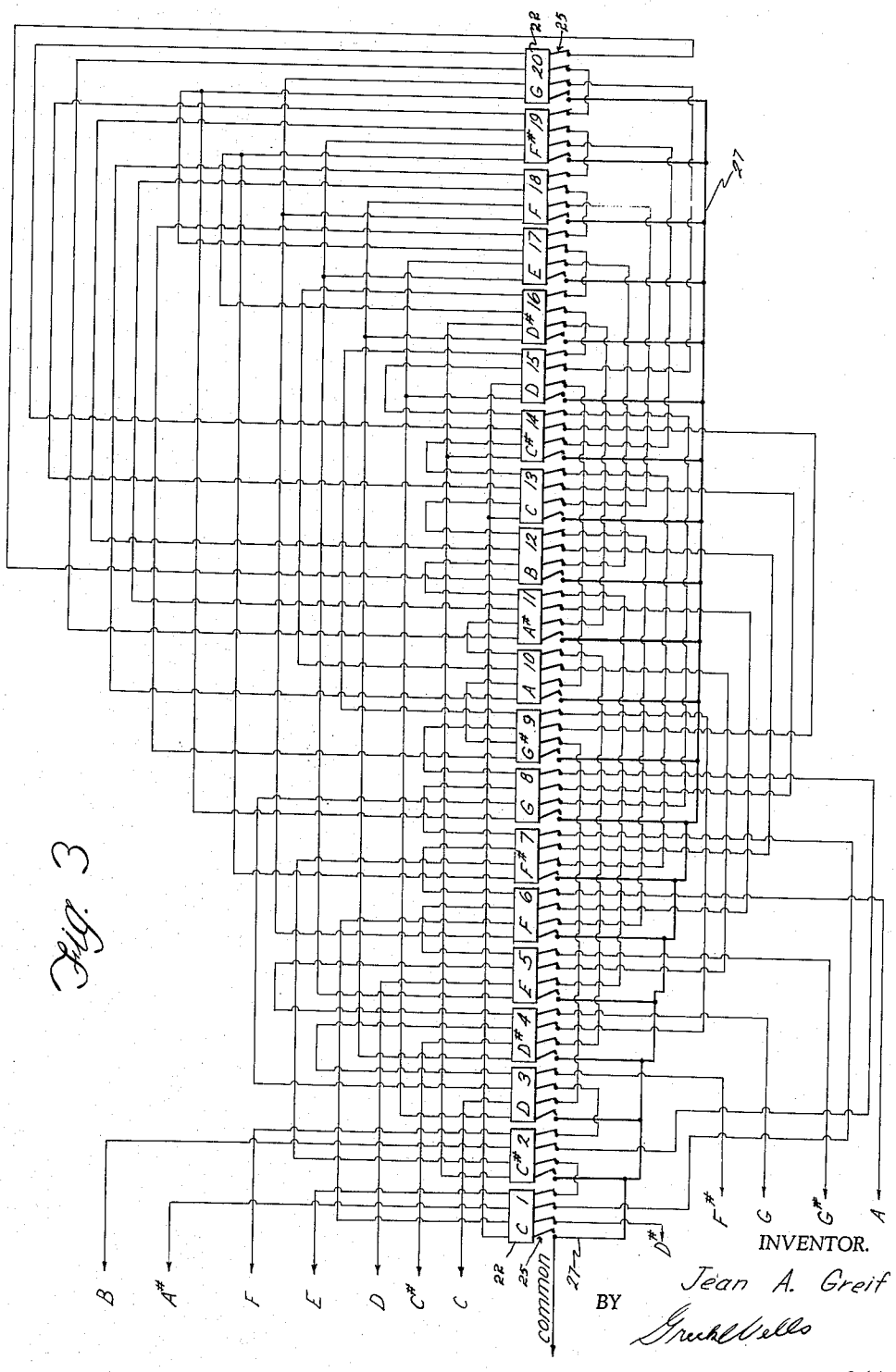


Fig. 3

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ATTACHMENT FOR AUTOMATICALLY PLAYING ROOT TONES OF CHORDS IN BASS SECTION OF ORGAN

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My invention relates to electric organs and similar instruments. The object of the invention is to select the root tone out of chords played on a keyboard of the instrument, using electric action, and to cause this root tone to be played in the bass or pedal tone section of the instrument without any foot action by the players.

In carrying out my invention I utilize a number of key contact blocks each of which has one normally open pair and three normally closed pairs of contacts. These blocks are mounted directly under the keyboard keys. The normally open pair of contacts is connected in parallel with the corresponding pedal controlled contacts (which act when the pedals are depressed) to play the corresponding bass pedal tones. In playing a musical chord, by depressing the key that plays the root tone of that chord, the normally open contacts of the block under that key are closed, completing the circuit to play the corresponding root tone in the bass or pedal section of the organ.

In order that only the root tone of the chord being played by the keys will be sounded in the pedal section, it is necessary to provide means whereby the depression of the keys corresponding to the other tones of that chord will not cause the corresponding tones (related minor 3rd, the major 3rd, diminished 5th, major and minor 5th and diminished 7th of the chord) to be played on the pedals.

The ideal system would be to break all of the circuits that allow the related tones of the root tone being played to sound, when their corresponding keys are depressed, so that no matter what chord (major, minor, diminished 7th, in any inversion) is played only the root tone will play in the pedal section. The three normally closed contact pairs in the contact block under each key are so connected in circuit as to accomplish the necessary breaking of these circuits of the tones not wanted. For example, in playing a chord in the key of C, by depressing the key to sound the root tone C, the normally closed contacts of the block under this key are opened and the circuits that would cause the pedal section minor 3rd, major 3rd and diminished 7th tones to play are broken. At first glance it would appear that no provision is made for cancelling out the 5th and the diminished 5th. However, when a chord (triad) is played, the major 3rd or minor 3rd tones are always played and the key that plays the major or minor 3rd tone will, when depressed, open the normally closed contacts of the block beneath it and thus break the circuits to the 5th controls of the pedal section. Likewise the key that plays the minor 3rd tone (as part of diminished C chord) will, when depressed, open the normally closed contacts of the block beneath it to tbreak the circuit to the diminished 5th control of the pedal section.

The detailed circuits and connections by which the playing of only the root tone of a chord in the base or pedal section of the organ is accomplished when the chord is played on the manual keyboard, will be more fully described hereinafter in connection with the accompanying drawings wherein a preferred embodiment of the invention is illustrated.

In the drawings:

FIGURE 1 is a somewhat diagrammatic view illustrating the connections from the contact pairs of two switch

blocks to the leads to the lower tone sounding contacts in the base section commonly played by the foot pedals;

FIGURE 2 is a schematic drawing showing the switch blocks and their wiring connections as used in playing a simple chord (triad), legends being added to the drawing.

FIGURE 3 is a wiring diagram illustrating the connections of the normally open and normally closed contact pairs of the several blocks necessary to cause the playing of only the root tone in the bass section of the organ when a chord is played on the lower manual keyboard of the organ.

The invention is applied to organs to enable one to play chords on the keyboard and automatically cause only the root tone of the chord being played to also be played in a lower octave, as in the bass section. The invention is applied to an organ by using a unit containing twenty switch blocks, each composed of one normally open pair of contacts and three normally closed pairs of contacts. This unit is positioned preferably so that the switch blocks lie under the twenty keys above the lowest octave of keys in the lower manual of the keyboard. More or less switch blocks may be used if desired.

Referring now to FIGURE 1, this figure shows the switch blocks as they are associated with the organ keys. Each key **21** of the organ under which a switch block **22** is to be placed is provided with a projection **23**. In some types of organs this projection **23** is, as shown in FIGURE 1, the means engaging the frame pieces **24** of the organ to limit upward movement of the keys **21** and keep them in line. The switch blocks **22** are preferably connected to each other to form a single bar or unit. The switch contact springs **25** are mounted in the unit of blocks **22** which is a molded bar of a plastic composition.

Each switch block **22** has one pair **25***a* of normally open contacts and three pairs **25***b*, **25***c* and **25***d* of normally closed contacts. One spring of each contact pair is extended into a felt padded bar **26**. The top spring of contact pair **25***a* and the bottom springs of contact pairs **25***b*, **25***c* and **25***d* are the ones connected to the bar **26**. The bar **26** is positioned directly beneath the corresponding projection **23** of the key under which that switch block **22** is placed. Wiring connections are made as indicated through the blocks **22** from a common current source wire **27** to the base section control wires **28** which, when connected in a completed electrical circuit, will cause their respective tones to sound.

Referring now to FIGURE 2, in this view there is illustrated the 12 switch blocks **22** that underlie keys C, C#, D, D#, E, F, F#, G, G#, A, A# and B that represent the notes of an octave. The block **22** at the extreme left of the figure is preferably placed beneath the next to lowest C key in the lower manual of the organ keyboard. The root tones in the bass section to be sounded automatically may be one or more octaves below the root tone of the chord played. The figure is drawn to indicate that the chord being played is a major C triad, first inversion. In playing this chord keys **1**, **5** and **8** are depressed. In the figure the key numbers are indicated on the switch blocks **22** and the keys are left out for simplicity. At C key (No. 1) when this key is depressed it closes the contacts **25***a* of the switch block **22** beneath it. This completes a circuit from the common conductor **27** through the contacts **25***a* and the closed contacts of a multipole switch **29** to the base section control conductor **28** for the corresponding root tone C (No. 1) in the base section which is represented directly below the switch blocks in FIGURE 2 by a series of switches **30**. These switches may be actuated by pedals, keys, or both as is the case in some organs. The root tone in the base section is thus played along with the root tone of the chord.

Key **5** (E) is also depressed to sound the major 3rd

tone of the chord and closes its root tone circuit at the contact 25*a* of the corresponding switch block 22 (No. 5), so that it would play its root tone (major 3rd of the chord) in the base section. But this circuit is broken by the depression of key C (No. 1), which opens contact pair 25*c* of the switch 22 under key C. This contact pair is shown connected in series with the contact pair 25*a* of the switch block 22 under key 5. Thus the major 3rd tone of the chord will not be played automatically in the bass section.

Key 8 (G) is also depressed to sound the fifth tone of the chord and closes its root tone circuit at the contact 25*a* so that it would play its root tone in the base section. However, this circuit is broken by the depression of either key 5 (E) or key 4 (D#) at their normally closed contacts 25*c* and 25*d* respectively. Since key 5 (E) is depressed in playing the chord, the fifth tone of the chord will not be played automatically in the bass section.

It will be noted that contact pair 25*b* of the switch block 22 under key C (No. 1) breaks the root tone circuit to the bass section for key D# (No. 4) so that if the minor 3rd tone were sounded in a chord in the key of C, then the corresponding tone in the bass section would not be played. Also in the drawing, FIGURE 2, it is shown how the contact pair 25*d* of the switch block 22 under key C (No. 1) breaks the root tone circuit to the base section for key A# (No. 11) to prevent the root tone of this (diminished 7th) being played in the bass section so long as key C is depressed. The diminished 5th tone sounding key is key F# (No. 7). This key is prevented from completing a circuit to its corresponding root tone in the bass section so long as key D# (No. 4) is depressed because the circuit from the common lead through the contacts 25*a* of the switch 22 beneath key F# (No. 7) to the bass section is broken at contact 25*c* of the switch block 22 beneath key D# (No. 4).

The wiring connections necessary for all of the twenty switch blocks 22 are illustrated in FIGURE 3 of the drawings. These connections follow basically the connections illustrated in FIGURE 2, but, in FIGURE 2 some of the connections are left out for the sake of simplicity. In FIGURE 3 the normally open contact of each switch block is shown as an open switch and the normally closed contacts of each block are shown as closed switches. In FIGURE 3 each switch block is marked with the musical note designation of the key it is placed beneath and is also numbered by position. The connections to the switch 29 and to the bass section control circuit are the same as in FIGURE 2 so they need not be described in detail herein.

The common current carrying wire 27 is shown in FIGURE 3 as connected to the left hand normally open switch of each switch block. Tracing the circuit from this switch for C (position No. 1) it goes to the normally open switch for C in the next higher octave (position No. 13) so that these two switches are in parallel. If either of these normally open switches is closed, circuit is completed through the left normally closed switch at D (position 15), then through the left normally closed switch at A (position 10), then through the left normally closed switch at G# (position 9), then through the left normally closed switch at D (position 3), then through the multiple contact switch 29 and to the control circuit for the key C in the bass section to sound the root tone C in the bass section.

Thus if either of the keys D (position 15 or 3), A (position 10) or G# (position 9) is depressed, the depression of the key C (at either position 1 or 13) cannot cause the sounding of the root tone C in the bass section.

By tracing the circuit it is found that the normally open switch at position 2, C#, is wired parallel to the normally open switch position 14, C#, so that the circuit from the common wire 27 through either of these switches is through left normally closed switch D# (position 16), left normally closed switch A# (position 11), right normally closed switch A (position 10), left normally closed switch D# (position 4), and the multiple contact switch 29 to the control circuit for the key C# in the bass section. Thus depressing either key D# at 16, A# at 11, A at 10, or D# at 4, will break the C# circuit to the bass section.

The normally open switches at D (position 3 and position 15) are connected in parallel to the common wire 27. Their circuit to the bass section can be broken by depressing key E at 17, key B at 12, key A# at 11 or key E at 5.

The normally open switches at D# (position 4 and position 16) are connected in parallel to the common wire 27. Their circuit to the bass section can be broken by depressing key F at 18, key C at 13, key B at 12, key F at 6, or key C at 1.

The normally open switches at E (position 5 and position 17), are connected in parallel to the common wire 27. Their circuit to the bass section can be broken by depressing key F# at 19, key C# at 14, key C at 13, key F# at 7, key C# at 2 or key C at 1.

The normally open switches at F (position 6 and position 18) are connected in parallel to the common wire 27. Their circuit to the bass section can be broken by depressing key G at 20, key D at 15, key C# at 14, key G at 8, key D at 3, or key C# at 2.

The normally open switches at F# (position 7 and position 19) are connected in parallel to the common wire 27. Their circuit to the bass section can be broken by depressing key D# at 16, key D at 15, key G# at 9, key D# at 4 or key D at 3.

The normally open switches at G (position 8 and position 20) are connected in parallel to the common wire 27. Their circuit to the bass section can be broken by depressing key E at 17, key D# at 16, key A at 10, key E at 5, or key D# at 4.

The normally open switch at G# (position 9) is connected to the common wire 27. (With twenty switch blocks there is no switch under G# in the upper octave so no parallel circuit is needed for this key.) The circuit through the switch at G# to the bass section can be broken by depressing key E at 17, key F at 18, key A# at 11, key F at 6 or key E at 5.

The normally open switch at A (position 10) is connected to the common wire 27. The circuit through this switch to the bass section can be broken by depressing key F at 18, key F# at 19, key B at 12, key F# at 7, or key F at 6.

The normally open switch at A# (position 11) is connected to the common wire 27. The circuit through this switch to the bass section can be broken by depressing key G at 20, key F# at 19, key C at 13, key G at 8, key F# at 7 or key C at 1. This confirms the explanation in connection with FIGURE 2 where it was pointed out that the diminished 7th (A#) circuit to the bass section was broken by depressing the key C.

The normally open switch at B (position 12) is connected to the common wire 27. The circuit through this switch to the bass section can be broken by depressing key G at 20, key C3 at 14, key G# at 9, key G at 8 or key C# at 2.

When the unit made up of the switch blocks 22 and the wiring connections just described is installed as described herein, the playing of a chord in the lower manual of the organ will, so long as the switch 29 is closed, cause the root tone, and only the root tone of the chord to be played in the bass section which is usually played by the pedals. This enables the player who cannot for any reason, play the pedals, to get pedal tones played automatically.

The insertion of the unit does not interfere with normal play of the organ. Opening of the multipole switch 29 breaks all of the circuits to the bass section so that normal play can proceed as usual with no possibility of discordant effects due to the presence of the switch block unit.

Having thus described my invention, I claim:

1. An attachment for electric organs, operable automatically, when a chord is played on the keyboard, to cause the sounding of the root tone of the chord in a lower octave in the bass section of the organ than that in which the chord is played, said attachment comprising a series of switch blocks operable by depression of the keys of the keyboard used in playing chords, each switch block including a normally open pair of contacts and a plurality of normally closed pairs of contacts, the normally open pair of contacts of each switch block being connected in the control circuit for the corresponding tone in a lower octave of the organ, the normally closed pairs of contacts of said switch being interconnected with normally open contact pairs of the switch blocks operable by depression of keys used to play certain related tones of said chord whereby depression of the root tone key of the chord prevents the sounding of the tones corresponding to said related tones in said lower octave.

2. The invention defined in claim 1 wherein a normally closed pair of contacts of at least one of said last named switch blocks is interconnected with the normally open contact pair of a switch block operable by depression of a key used to play another one of the related tones of said chord so as to prevent the sounding in the lower octave of the tone corresponding to said other related tone.

3. An attachment for electric organs operable automatically, when a chord is played on the keyboard, to cause the sounding of the root tone of that chord in a lower octave in the bass section of the organ than that

in which the chord is played, said attachment comprising a series of switch blocks mounted beneath the keys of the keyboard used in playing chords, each switch block including a normally open contact pair and a plurality of normally closed contact pairs, and means operable by depression of the key thereover to close the normally open contact pair and open the normally closed contact pairs, circuit completing connections from each open contact pair to the control circuit for the corresponding tone in a lower octave of the organ, and circuit connections through the normally closed pairs of contacts of each switch block to the control circuits of the related major 3rd and minor 3rd tones of said corresponding tone in the lower octave.

4. The invention defined in claim 1 wherein a manually operable multiple switch interposed between the control circuits of said lower octave and said switch blocks, is operable to break all connections from said switch blocks to the lower octave control circuits.

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