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G10H 5/00 (2006.01)

(56) Documents Cited:
EP 1453035 A1 **WO 1998/050904 A1**
US 4056996 A1 **US 3665089 A1**

(58) Field of Search:
INT CL **G10H**
Other: **EPODOC, WPI**

(54) Title of the Invention: **Smart paraphonics**
Abstract Title: **Applying modulation by pressing keys on a synthesizer keyboard**

(57) A process whereby electronic musical note signals from a plurality of concurrent key presses on a monophonic synthesizer are processed according to pre-programmed criteria whereby one key press determines the pitch of the resulting note, the other key presses determining the modulation applied to the note, the nature of the modulation depending on the relative position of the keys pressed. Preferably mixed note data generated by two key presses is processed differently according to priorities, for example the lower-keyed note determining the primary pitch, and the higher-keyed note determining the modulation. The criteria may allow that a lower-keyed note be sounded as a bass note and a higher-keyed note as a lead note. In a preferred embodiment, two key presses results in mixed note data with lower note data being sent to the primary oscillator to emit a note of a given pitch. The higher and lower note data is sent to a signal subtractor which determines the difference between the high and low note and assigns modulation based on the difference. The arrangement allows notes and modulation to be performed using the keys of a keyboard synthesizer.

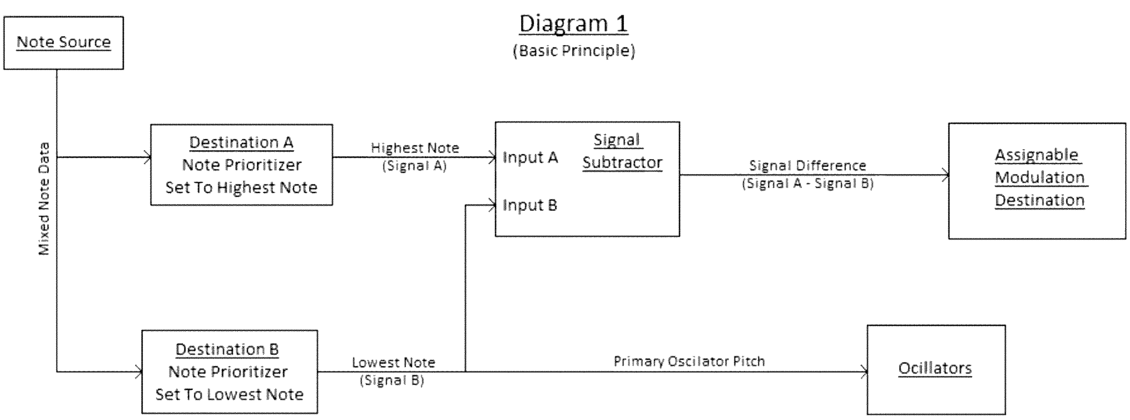

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Diagram 1

(Basic Principle)

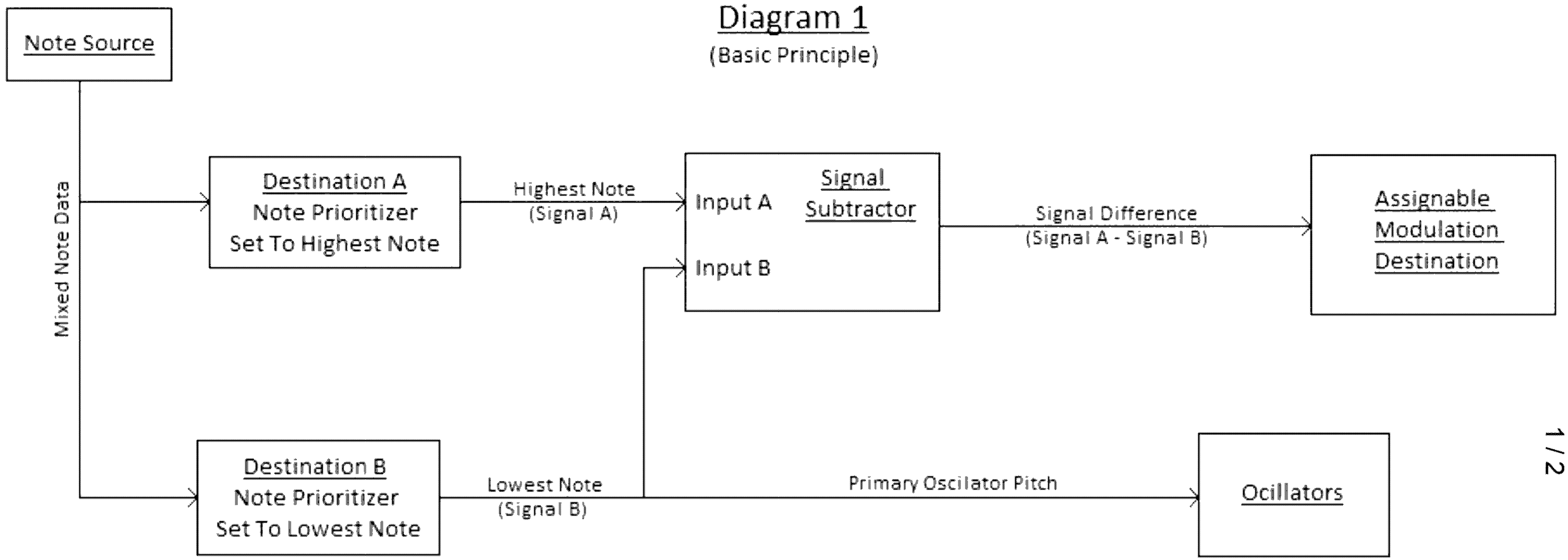
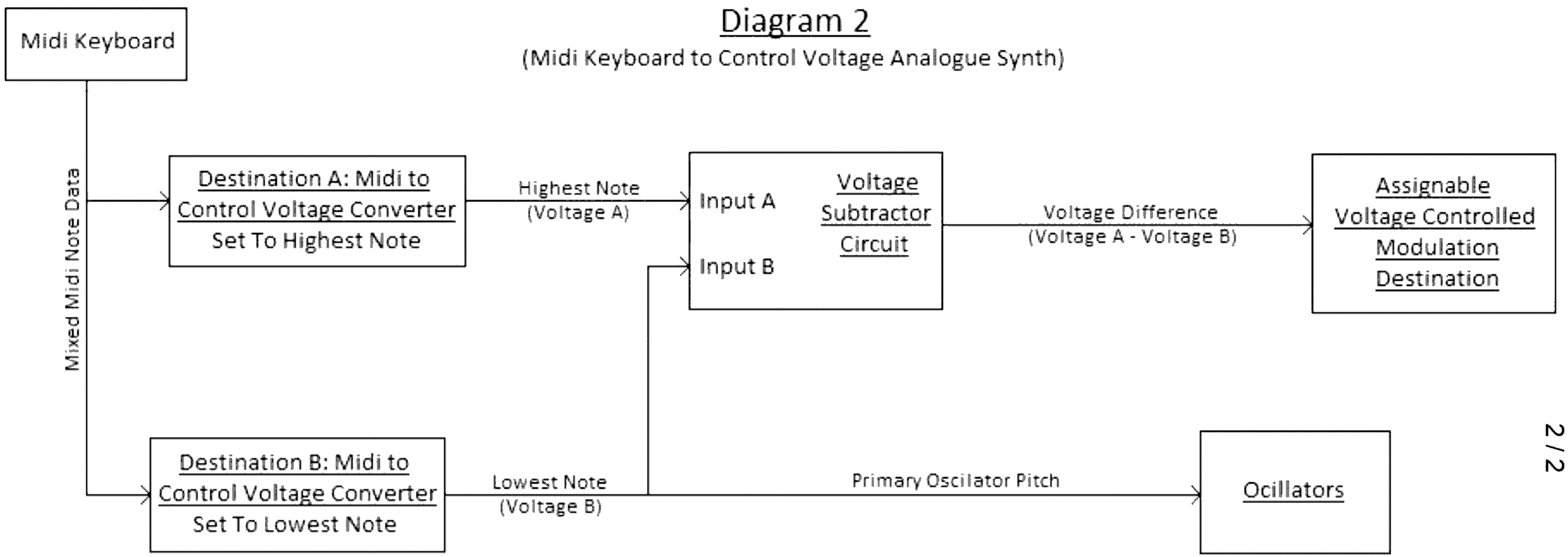


Diagram 2

(Midi Keyboard to Control Voltage Analogue Synth)



Description:

A new sound synthesis technology designed for (but not exclusively applicable to) monophonic sound synthesizers. This new technology allows the player of a keyboard synthesizer to play a note via a key on the keyboard while simultaneously using another key on the same keyboard to impart a modulation. This could also be implemented using pads, sequencers or any other means by which notes are triggered.

This is achieved by sending the key press/note data from the keyboard to two or more separate locations which filter the note data using note priorities. These priorities could be: high note, low note, middle note, last note, first note or otherwise. One of the locations that the note data is sent to is for the primary pitch, which is the main note that all the oscillators are responding to. The one or more other locations that the note data is sent to are used as modulation sources by calculating the difference between the primary pitch and the modulating key press.

If for example a low note priority is set for the primary pitch and a high note priority is set for a modulating key press, then playing two note chords on the keyboard will result in the lower note played being the primary pitch that all oscillators respond to, and the higher note played will cause a modulation. If our example synthesizer has 4 oscillators making up the usual monophonic tone and this modulation is set to affect the pitch of only 2 oscillators, then two of the oscillators will respond solely to the lowest note played and two of the oscillators will respond to the modulation and produce the higher note played. If, using the same example set up, a single note is played on the keyboard then the singular note will be both the highest and lowest note meaning that all oscillators will respond to this one pitch. With this modulation routing, a monophonic synthesizer with more than one oscillator can play chords live using the keyboard (as opposed to setting a permanent chord with the oscillator settings or automating different chords by sequencing the oscillator settings) without compromising the tone of a single note, as is the case with current paraphonic synthesizer technology. If in our example the modulating key press is routed to filter cut-off frequency instead of two of the oscillator's pitches, then all oscillators will respond solely to the lowest note and the filter will open and close in response to the highest note. A single note played with this modulation setting will keep the filter cut-off at the pre-set frequency.

Using the same 4 oscillator monophonic synthesizer, if two of the oscillators are set to play 2 octaves lower than the other two oscillators using the normal oscillator settings, and a higher note priority is set for one of the pairs and a lower note priority for the other, then you can effectively play a bass line and a totally different lead line all in one hand. These parts will not be limited by a set keyboard split as would be the case with any other keyboard being used to play two different parts live and simultaneously, so the player is free to play both parts anywhere on the keyboard. The bass and lead lines are limited however, by not being able to cross over each other on the keyboard. This is still a fantastic ability for a keyboard player as it would allow a synthesizer player who also has a drum machine to play a lead and a bass line in one hand and the drum machine in the other effectively making him a totally live one man electronic band.

In diagram 1, I have outlined the basic principle that makes this technology work whether it is implemented as analogue or digital, or as hardware or as software. The mixed keyboard note data is sent to two locations (Destinations A and B) that will simultaneously filter the notes using a high note and a low note priority. For this example, we'll say that two notes are being played on the keyboard. The higher of the two notes will be sent as signal A to the signal subtractor. The lower of the two notes will be sent as signal B to both the signal subtractor and to the oscillators as the primary pitch. In the signal subtractor, signal B is taken away from signal A and the difference is sent to an assignable destination as a modulation source. As signal A is set to high note, the modulating signal will be positive. If the note priorities were swapped so that signal A was the low note and signal B was the high note, then the modulation signal would be negative. Either signal is usable as a modulation source, and other combinations of note priorities which may result in various modulation outcomes are also possible. If the modulation signal is sent to an oscillator pitch, it will cause the pitch of that oscillator to go up or down by the modulation amount depending on whether the signal is positive or negative. This amount will also vary depending on the difference between the notes played on the keyboard, so changing the type of chords you play will change the modulation amount.

In diagram 2, I have shown how this technology would work in a control voltage environment controlled from a midi keyboard which is a common format for a modern analogue keyboard synthesizer. We'll assume again that two notes are being played simultaneously on the midi keyboard. Let us say that these notes are a C4 and an F#4. The midi note data from these two notes is sent to two midi to control voltage converters which I have labelled Destination A and Destination B. It is these midi to control voltage converters that filter the notes by note priorities. We will again say that Destination A is set to high note priority (and will pass the F#4) and Destination B is set to low note priority (and will pass the C4). The midi signals are also converted into control voltage signals at the two destinations. If we are using a 1 volt per octave setup, as is fairly common, then the voltage sent from Destination A, which we shall call Voltage A, will be 4.5V (for F#4) and the voltage sent from Destination B, which we shall call Voltage B, will be 4V (for C4). Voltage B will be sent to the oscillators and they will respond accordingly depending on the current settings. Let us assume though that all oscillators are set to respond normally to 4 volts by producing a C4. Voltage A will be sent to the voltage subtractor circuit. Voltage B will also be sent to the voltage subtractor circuit so it can be subtracted from Voltage A. The resulting signal will be Voltage A – Voltage B, or in our case 4.5V – 4V which equals 0.5V. This 0.5V is then sent as a routable modulation, which can be assigned to control all sorts of parameters. If it is sent to the pitch of an oscillator, then that one oscillator will rise in pitch by 6 semitones and produce an F#4 (as was the modulating key played on the keyboard). If it is sent to the filter cut-off (on a 1V per octave voltage control filter), then the cut-off frequency of the filter will rise by 6 semitones. The 0.5V could be routed to any other voltage controlled parameter to impart a modulation and yield all sorts of results.

Claims:

- Note data created by a keyboard, pads, a sequencer or any other source is taken to two or more separate locations and filtered by note priorities before being sent to oscillators and modulation routings.
- The differences between modulating key presses and main oscillator pitch key presses are used as the source of modulation.
- Allows notes and modulations to be played simultaneously on one keyboard with nothing but key presses.
- Sequences of modulations can be played live on the keyboard alongside and yet separate to sequences of notes being played via the same keyboard.
- Chords can be achieved on a monophonic synthesizer with two or more oscillators without losing the power of all oscillators while one key is pressed.
- Varying chord types can be played live on a monophonic synthesizer with two or more oscillators without having to continuously change oscillator settings via a menu or knob (and still without ever losing the use of any of the oscillators on board no matter how many keys are pressed).

Intellectual Property Office

Application No:	GB1416479.2	Examiner:	Ralph Plowman
Claims searched:	All	Date of search:	6 May 2015

Patents Act 1977: Search Report under Section 17

Documents considered to be relevant:

Category	Relevant to claims	Identity of document and passage or figure of particular relevance
X	All	US4056996 A1 (BUNGER) See whole document.
X	All	WO 98/50904 A1 (TOTTER) See whole document.
X	All	US3665089 A1 (STEARNS) See whole document.
X	All	EP1453035 A1 (YAMAHA CORP) See whole document.

Categories:

X	Document indicating lack of novelty or inventive step	A	Document indicating technological background and/or state of the art.
Y	Document indicating lack of inventive step if combined with one or more other documents of same category.	P	Document published on or after the declared priority date but before the filing date of this invention.
&	Member of the same patent family	E	Patent document published on or after, but with priority date earlier than, the filing date of this application.

Field of Search:

Search of GB, EP, WO & US patent documents classified in the following areas of the UKC^X :

Worldwide search of patent documents classified in the following areas of the IPC

G10H

The following online and other databases have been used in the preparation of this search report

EPODOC, WPI

International Classification:

Subclass	Subgroup	Valid From
G10H	0005/06	01/01/2006
G10H	0001/38	01/01/2006
G10H	0005/00	01/01/2006