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Ideas about a 7-octaves chromatic keyboard

The keyboard of a piano or a keyboard (the instrument) is strongly related to the normal staff notation because the white keys correspond to the tones of the major scale of C. For this scale, there is a halve distance in between the B and the C and in between the E and the F. For these tones, there are no black keys on the keyboard in between the corresponding white keys. An important disadvantage of the normal piano keyboard is that for every key, different fingerings are required if one wants to play a scale or a chord. If one can play on a guitar, a violin or a double bass without using loose strings, the fingerings for adjacent keys are identical because one simply changes position. In this note I show that it is possible to design a keyboard for a piano or a keyboard for which the fingering is equal for every key. The instrument can therefore be plaid much easier than a normal piano or keyboard and one saves the time which has to be spent for a normal keyboard to endlessly practicing difficult scales.

Several efforts have been made in the past to improve the keyboard of a piano. The best well known effort is the Jankó keyboard for which there are three contact points on every key. But the Jankó keyboard is still related to the normal staff notation. Another effort had been made by Heinrich Joseph Vincent who proposed to add a black key in between every white key. Therefore pressing the white keys gives a whole tone scale and the same is valid for pressing the black keys. Now there are only two fingerings for a certain scale depending on if one starts with a white or with a black key. An additional benefit is that the pitch in between an octave is one key smaller.

For the button accordion, a type exists which has three rows of buttons for the right hand. The second row sounds a halve tone higher than the first row and the third row sounds a halve tone higher than the second one. For this type, there are three fingerings to play a certain scale depending on with which row one starts. There are also button accordions to which an extra fourth row is added which sounds the same as the first row. There are even button accordions to which an extra fifth row is added which sounds the same as the second row. For this last instrument one can play every scale with the same fingering. Modulation is therefore rather simple with this instrument but a keyboard with five rows makes the instrument rather complicated and heavy. However, the keyboard of a button accordion gave me the idea for the new keyboard of a piano or a keyboard.

For a button accordion, the round keys are lying at the corner points of an equilateral triangle and the distance in between adjacent keys is therefore equal. Therefore, the keyboard is very compact and many keys can be mounted within a limited length. This principle is also used for the new keyboard of a 7-octaves keyboard but in the first instance only two rows of keys are used. This figuration is therefore about similar to the keyboard of Heinrich Joseph Vincent but instead of long rectangular keys, round keys are used. The tones in one row give a whole tone scale. If one changes in between the first and the second row, one gets a chromatic scale and this new keyboard is therefore called a chromatic keyboard. Now there are only two fingerings for a certain scale depending on with which row one starts. If a third row is added which sounds the same as the first row, only one fingering is needed for a certain type of scale. This option is shown in figure 1 for one chromatic octave.

For the names of the tones and the keys one can use the normal staff notation or one can use the so called α-staff notation which is described in chapter 4 of my note ”A staff notation without flats or sharps” which can be copied from my website: www.kdwindturbines.nl at the menu “No wind energy”. An advantage of the α-staff notation is that it is very compact and that seven chromatic octaves can be rendered on two identical staffs separated by one auxiliary line and if one auxiliary line is added below the lower staff and if three auxiliary lines are added above the upper staff. So it is very well suited to a 7-octaves keyboard.

However, it deviates strongly from the normal staff notation and therefore there is only a little chance that it will ever be implemented. So although this α-staff notation fits well to the new keyboard, the names for the tones out of this staff notation won't be used.

In chapter 3 of the above mentioned note, a staff notation is described without flats and sharps for which the black key tones have a triangular shape and for which the normal names of the tones are used. This name-giving will therefore also be used for the new keyboard. The seven white key tones have as names C, D, E, F, G, A and B. For the five black key tones, only the flattened names are used, so D♭, E♭, G♭, A♭ and B♭. For certain keys, this name-giving isn't in accordance with the name-giving of the logic of the circle of fifths but I prefer a name-giving for which the black key tones have one unequivocal name.

To be able to recognise the keys well, the keys which belong to the white key tones of a normal keyboard are made white. The keys which belong to the black key tones of a normal key board are made black. The corresponding name of the tone is engraved on the white keys.

In figure 1, the three rows are rendered for one octave with engraved names for the white key tones. No name is engraved into the black key tones because it would be difficult to read this name and because now it is still possible to give the key a double name depending on if the tone is seen as sharpened or flattened.

The first and the third row start with a C and end after seven octaves with a C too. The second row starts with a B and ends after a little more than seven octaves with a D♭. So the keyboard is symmetric with respect to the heart of the second row. It is also symmetric with respect to a vertical line through the G♭. Only the colour pattern isn't symmetric.

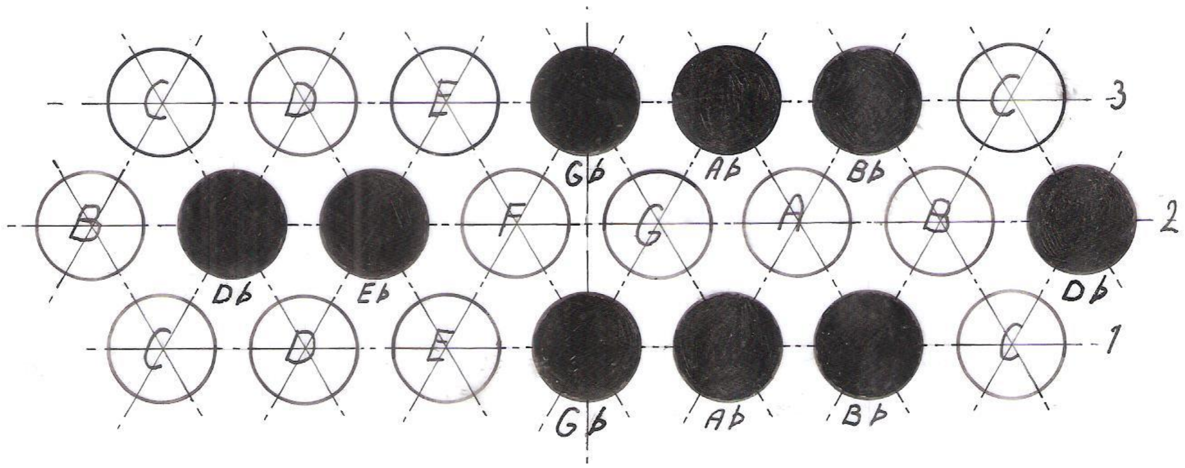

Figure 1 New chromatic keyboard for one octave with three rows of keys

There are two options to play scales for different keys.

1) One starts a scale with the first or with the second row and one goes upwards for a tone which isn't in the row.

2) One starts a scale with the third or the second row and goes downwards for a tone which isn't in the row. Provisionally it is assumed that option 1 is chosen.

If one wants to play a major scale in C on this keyboard one has to press the following keys: C, D, E, F, G, A, B, C. The keys C, D, E and C are lying at the first row. The keys F, G, A and B are lying at the second row.

If one wants to play a major scale in D♭ on this keyboard one has to press the following keys: D♭, E♭, F, G♭, A♭, B♭, C, D♭. The keys D♭, E♭, F and D♭ are lying at the second row. The keys G♭, A♭, B♭ and C are lying at the third row. So the pattern is equal to that of the major scale of C but only different rows are used.

If one wants to play a minor scale in C in a rising line on this keyboard one has to press the following keys: C, D, E♭, F, G, A, B, C. The keys C, D and C are lying at the first row. The keys E♭, F, G, A and B are lying at the second row.

If one wants to play a minor scale in D♭ in a rising line on this keyboard one has to press the following keys: D♭, E♭, E, G♭, A♭, B♭, C, D♭. The keys D♭, E♭ and D♭ are lying at the second row. The keys E, G♭, A♭, B♭ and C are lying at the third row. So the pattern is equal to that of the minor scale of C in increasing line but only different rows are used.

The scales of D, E, G♭, A♭ and B♭ make use of the same rows as for the scale of C. The scales of E♭, F, G, A and B make use of the same rows as for the scale of D♭.

For playing of chords, the same principle counts as for playing of scales. Also for chords one has the choice to use keys from the first or from the third row. Even if the pitch in between the keys would be chosen the same as the pitch of the white keys of a normal keyboard, tones belonging to large intervals will lay closer to each other and large chords can therefore be plaid easier. Because all adjacent keys are lying at the same distance from each other, probably a smaller pitch is allowed than the pitch of a normal keyboard which is 23.5 mm.

Figure 1 was drawn for a pitch of 20 mm and a key diameter of 15 mm. For the normal keyboard the pitch of one octave is 7 * 23.5 = 164.5 mm. For the chromatic keyboard the pitch of one octave is 6 * 20 = 120 mm. So the chromatic keyboard is a factor 120 / 164.5 = 0.729 more compact and therefore bigger intervals can be taken with one hand. As the keyboard is more compact, its length with seven octaves is only a little longer than the length of a normal keyboard with five octaves. If the fingers need more space, the distance in between the rows can be increased and one can use oval keys. In figure 2, the whole keyboard is given. The keyboard has totally 130 keys and 87 different tones.

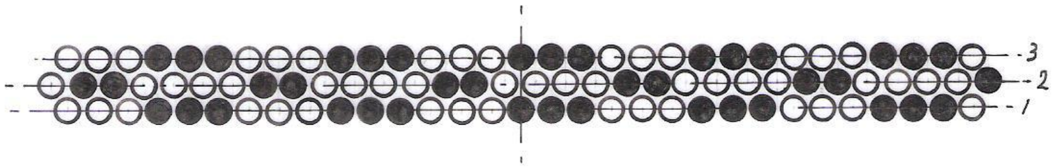

Figure 2 New chromatic keyboard for a 5-octaves keyboard

Equal keys of the first and the third row are lying opposite to each other and can be coupled mechanically like it is also done for a button accordion. However, one has to take care that the mass of the first and third row together isn't larger than the mass of the second row because otherwise the instrument might feel strange. How this instrument has to be built mechanically, that I leave to the manufacturer. Hereby the idea is made public and everyone is allowed to use it.

For someone who is familiar to the keyboard of a normal piano or keyboard, this new keyboard may look strange but I hope that he sees the advantages. I think that one can learn to switch in between two different keyboards. There are people who alternately play saxophone and clarinet and the fingerings of these instrument also deviate strongly from each other.