(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) **EP 4 006 895 A1**

(12) **EUROPEAN PATENT APPLICATION**

(43) Date of publication:
01.06.2022 Bulletin 2022/22

(21) Application number: **21000339.8**

(22) Date of filing: **24.11.2021**

(51) International Patent Classification (IPC):
G10D 1/08 *(2006.01)* ***G10D 3/06*** *(2020.01)*

(52) Cooperative Patent Classification (CPC):
G10D 1/08; G10D 3/06

(84) Designated Contracting States:
AL AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO PL PT RO RS SE SI SK SM TR
Designated Extension States:
BA ME
Designated Validation States:
KH MA MD TN

(30) Priority: **30.11.2020 IT 202000029135**

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(54) STRINGED MUSICAL INSTRUMENT, IN PARTICULAR ELECTRIC BASS

(57) A stringed musical instrument (1, 1 ', 1' '), in particular an electric bass, comprising a body (2), a neck (3) extending in one direction (D) from the body, a set of strings (6, 6 ', 6' ') arranged in sequence from a highest string (6a) to a lowest string (6b), a first string support element (7) arranged on the body (2) and a second string support element (11) arranged on the neck (3), in which the distance (d1) between the first and second string support elements (7, 11) defines the maximum vibration length of the strings and is included between 55.6 cm and 59.6 cm, the diameter of the lowest string (6b) is between 2.79 mm and 3.42 mm and the note emitted by the lowest string (6b) when it is vibrated as open string is a Mi (E).

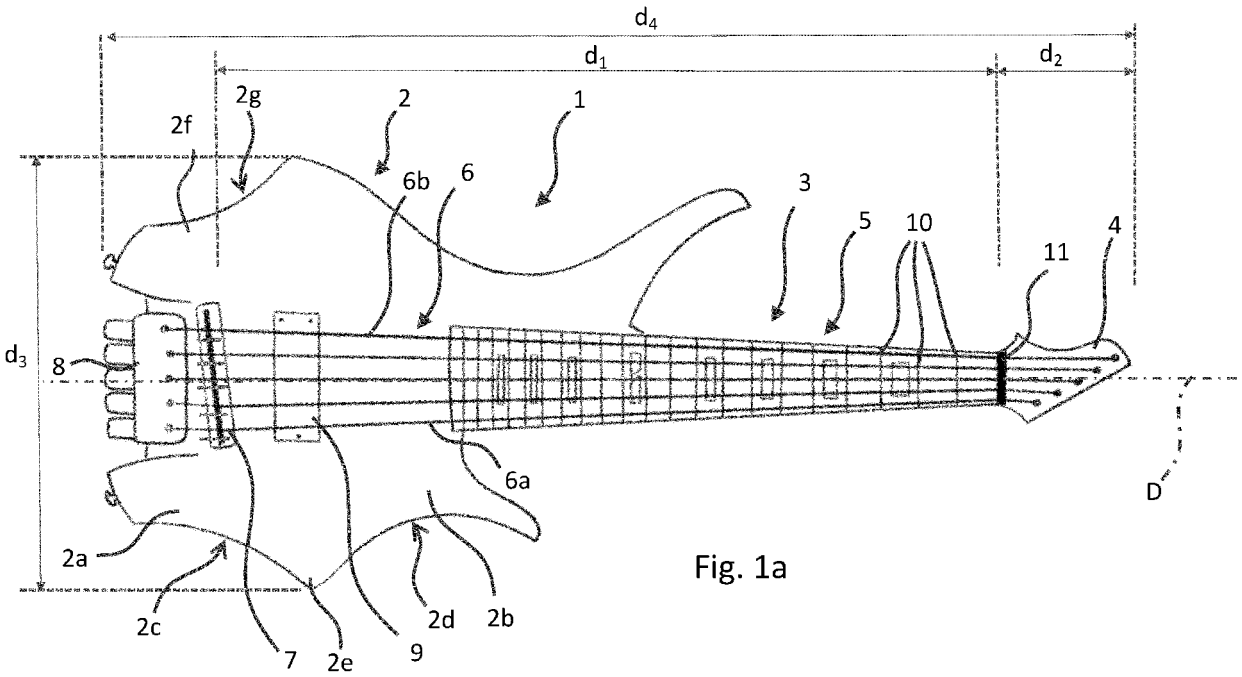

Fig. 1a

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Description

[0001] The present invention relates to a stringed musical instrument, in particular an electric bass.

[0002] A typical electric bass includes a body, a neck, a headstock and a plurality of strings. The strings, usually in number between four and six, extend between the body and the headstock along the neck.

[0003] The body represents the most voluminous part of the instrument and can have various shapes and sizes. In an electric bass the body has no resonance chamber, found instead in other stringed instruments, such as the acoustic guitar and the double bass. On the body there is an element called the bridge, on which a first end of the strings is anchored.

[0004] In the more traditional electric basses the headstock is provided with a plurality of elements (in number equal to the strings) called pegs, together defining the so-called tuning machine, on which the second ends of the strings are wound. The pegs rotate around their own axis, to allow the adjustment of the tension of the strings and, therefore, the intonation of the strings themselves.

[0005] However, there are models of electric bass in which the tuning machine, instead of being present on the headstock, is placed on the body. In such types of basses the first end of the strings is fixed to the tuning machine on the body and the second end is fixed to the headstock.

[0006] The neck is the part of the instrument along which the strings extend, stretched between the body and the headstock, and is provided, on the same side on which the strings extend, with a fingerboard, defined by a surface on which it is possible to press the vibrating strings in order to vary the intonation of the notes produced. The fingerboard is usually equipped with a plurality of frets, defined by respective metal bars arranged transversely to the extension of the neck. Normally the number of the frets present in an electric bass varies between twenty and twenty-four.

[0007] The beginning of the fretboard is defined by an element called nut, made of a bar with grooves, each of which houses a respective string. The nut and the bridge represent the two supporting elements of the strings on the two opposite sides of the instrument and their mutual distance defines the length of the vibrating open string, that is the distance between the two points supporting the maximum vibrating part of the string. This length is also called diapason and defines the scale of the instrument.

[0008] In modern electric basses the standard scale is about 87 cm (86.36 cm to be precise, or 34 inches), while in a typical guitar it is about 77 cm. However, there are models of electric bass with scales of different lengths, such as the so-called "short scale" models, with a scale of 77 cm, i.e. about thirty inches. The total length of a standard electric bass is about 116 cm.

[0009] Below are indicated and (expressed both in inches and in millimeters) the most common scales for electric basses, as well as some examples of commercial models of electric bass that use such scales:

- 28.5" = 724 mm - Fender Jaguar Bass VI Custom;
- 30" = 762 mm - Mustang Bass Musicmaster Bass;
- 30.5" = 775 mm - Gibson EB-1, EB-0 and other EB, Gibson SG bass;
- 33.25" = 845 mm - Rickenbacker 4000 series;
- 34" = 864 mm - most common scale for electric basses;
- 35" - 36" = 889-915 mm - extra-long scale electric basses;
- 41" - 44" = 1000-1120 mm - Electric Upright Bass (EUB) and doublebasses.

[0010] Typically the strings of the electric bass are made of steel, with a solid core, with a circular or hexagonal section, and an external winding that allows the string to reach a weight such as to place it, along the spectrum, at the right octave. The type of winding also determines the type of surface of the string, which can be rough, semi-smooth and smooth. In some cases the metal string can be covered with synthetic material.

[0011] In the following description the notes will be indicated according to the nomenclature used in non-English-speaking countries, but from time to time the corresponding indicative letter will be indicated between brackets according to the nomenclature used in the English-speaking countries, according to the following relationship: A = La, B = Si, C = Do, D = Re, E = Mi, F = Fa, G = Sol.

[0012] The four-, five- and six-string bass typical tunings are as follows (in order of height from the highest to the lower):

- four-string bass: Sol, Re, La, Mi;
- five-string bass: Sol, Re, La, Mi, Si; or Do, Sol, Re, La, Mi;
- six-string bass: Do, Sol, Re, La, Mi, Si.

[0013] Hence, additional strings in the five and six-string basses are above and below those of the four-string bass respectively.

[0014] The note emitted by a vibrating string is uniquely connected to its vibration frequency which depends on a series of parameters according to the following equation (vibrating string equation):

$$f = \frac{1}{2lr^2}\sqrt{\frac{t}{(\pi\rho)}}$$

where f is the frequency, l the length of the vibrating part of the string, ρ the volumetric density of the string, r the radius of the string section and t the tension of the string. The frequency of vibration of the string is therefore inversely proportional to the square of the radius of the string section.

[0015] The diameter of the strings is typically measured in inches (1 inch = 2.54 cm). The term gauge refers to the range of the diameters (or gauges) of the strings that make up the set of strings, expressed in thousandths of an inch. The most common gauges in four- and five-string basses is 45-105 and 45-125, respectively, where the first number refers to the diameter of the first string and the second number refers to the diameter of the fourth string in a four-string bass, or to the diameter of the fifth string in a five-string bass.

[0016] The shape of the electric bass is also quite standard, although there are uncommon models and prototypes with different shapes. The body of a standard bass is quite similar to that of a classical guitar, with a recess at the bottom that creates a support for the left or right leg.

[0017] One of the defects of the standard electric basses is that they are big, which makes them unsuitable for transport and uncomfortable for the musician.

[0018] Traditional electric basses also have poor ergonomics, especially when played while sitting, as they tend to cause a twisting of the spine. This torsion occurs both when the traditional lower concave portion of the case is placed on the left leg (so that classical guitarists are forced to use the footrest for the left leg), and (and above all) when it is placed on the right leg. In addition, when the instrument is placed on the left leg, the neck is even further away from the player's body and, therefore, the left arm must be held in a more extended position, more uncomfortable and difficult to maintain.

[0019] For left-handed instruments the same considerations apply to the support on the leg opposite to the one indicated above.

[0020] The problem of ergonomics in the seated use of a musical instrument of the guitar type is for example addressed in the German patent DE2312766, which suggests creating in the lower part of the body of the instrument a double concavity for simultaneous support on both legs of the user, when he is in a sitting position.

[0021] The purpose of the present invention is to make a stringed musical instrument without the previously mentioned inconveniences.

[0022] The Applicant has found that, with an appropriate sizing and an appropriate shape of some parts of the instrument, it is possible to create an electric bass with better portability and ergonomics than the standard electric basses.

[0023] In particular, the Applicant has found that an electric bass having a scale between 55.6 cm and 59.6 cm and a bigger string diameter between 2.79 mm and 3.42 mm may have the same low register (i.e. the low Mi note normally obtained with a four-string bass) of an electric bass with standard characteristics but considerably smaller dimensions. The above range of values of the diameter of the low string is of a standard Si string. As for the high register, if the bass is made of five strings and twenty-one frets, it is possible to reach a high La, therefore a whole tone above a traditional four-string bass with twenty-four frets; if the bass is made with four strings and twenty-one frets, you can get to a high Mi, which still corresponds to a half-tone above a traditional four-string electric bass with twenty frets (such as the one made by the Fender company).

[0024] The Applicant has found that, if the scale and diameter of the low string are contained in the above ranges of values, the low string can be tuned to low Mi note thanks to an appropriate adjustment of its tension. The Applicant has also verified that the intonation on the low Mi note of the string with the previously mentioned diameter is even easier if the range of the diapason is in a smaller range than the one indicated above, in particular between 56.6 cm and 58.6 cm. A particularly advantageous scale value is around 57.6 cm.

[0025] In practice, the distance between the nut and the bridge at the bottom of the present invention is equivalent to the distance between the seventh fret and the bridge in a standard bass. In addition, the tension of the strings of the bass of the present invention is reduced by two semitones compared to the one that would allow to have at the nut the same notes that you have at the seventh fret of a standard electric bass, so that at the nut you will have the same notes that you have at the fifth fret of a standard electric bass. So, if made with five strings, the bass of the present invention can be made with the standard Sol, Re, La, Mi, Si strings (set of strings commonly found on the market) but due to the reduced scale and the lowering of two semitones such strings will intone respectively the notes Do, Sol, Re, La, Mi.

[0026] The bass produced in this way is therefore much smaller in size than a traditional bass and is therefore particularly manageable and light, as well as having greater ergonomics that allow a more natural posture of the player with less torsion of the body.

[0027] The Applicant also found that by shaping the body of the bass in such a way as to realize a concave surface of support for the player's leg positioned in the lower part of the body of the bass farthest from the neck, it is possible to

obtain the same centering of the bass on the player's body when in the sitting position compared to when the instrument is played in an upright position.

[0028] The present invention is therefore related to a musical stringed instrument, in particular an electric bass, comprising a body, a neck extending in one direction from the body, a set of strings arranged in sequence from a highest string to a lowest string, a first supporting element of the strings placed on the body and a second support element of the strings placed on the neck, the distance between the first and second supporting element of the strings defining the maximum length of vibration of the strings, characterized by the fact that the distance between the first and second supporting element of the strings (i.e. the scale of the instrument) is between 55.6 cm and 59.6 cm, that the diameter of the lowest string is between 2,79 mm and 3,42 mm and that the note emitted by the lowest string when it is vibrated as open string is a Mi (E) at 41,2Hz.

[0029] Preferably, the distance between the first and second supporting element of the strings is between 56,6 cm and 58.6 cm. The Applicant considers that this narrower range is preferable because for values below 56.6 cm the lowest string risks having an insufficient tension to be able to tune a Mi and furthermore the distance between the nut at the end of the fretboard is likely to be too small, while for values above 58.6 cm the bass tends progressively to approach a normal electric bass with reduced scale.

[0030] A preferred value of the distance between the first and second supporting element of the strings is equal to about 57.6 cm.

[0031] In addition, the number of strings is preferably between four and six.

[0032] In a first embodiment the number of strings is equal to five. In this case the note emitted by the highest string when vibrating as open string is a Do (C). In particular, if the instrument is five-stringed, the notes emitted by the strings when vibrating as open strings are Mi, La, Re, Sol and Do when moving from the lowest string to the highest one, respectively.

[0033] In a second embodiment the number of strings is equal to four. In this case the note emitted by the highest string when vibrating as open string is a Sol (G). In particular, if the instrument is four-stringed, the notes emitted by the strings when vibrating as open strings are Mi, La, Re and Sol when moving from the lowest to the highest string, respectively.

[0034] In a third embodiment the number of strings is equal to six. In this case the note emitted by the highest string when vibrating as open string is a Fa (F). In particular, if the instrument is six-stringed, the notes emitted by the strings when vibrating as open strings are Mi, La, Re, Sol, Do and Fa when moving from the lowest to the highest string, respectively.

[0035] In addition, the instrument preferably comprises a fingerboard, said fingerboard in turn comprising a plurality of frets. The number of frets is preferably between seventeen and twenty-four, for example equal to twenty-one.

[0036] The distance X_n of each fret from the first supporting element of the strings is regulated by the equation $X_n=L(1-1/r^n)$, where:

- n is the number of the considered fret;
- L is the scale of the instrument, corresponding to the distance between the first and second supporting element of the strings (and therefore between 56.6 cm and 58.6 cm);
- r is a constant equal to $2^{(1/12)}$.

[0037] In a preferred embodiment, the body of the instrument presents, in its lower and backward portion, a concave surface with the concavity facing outwards of the body. By backward portion of the instrument it is intended the one furthest from the neck.

[0038] Preferably, the first supporting element of the strings extends along a direction that intersects the concave surface.

[0039] In addition, always in a preferred embodiment, the body of the instrument presents, in its lower portion, two concave surfaces with the concavity facing the outside of the body joined by a portion of the edge.

[0040] The body of the instrument may have a concave surface with the concavity facing outwards even in its upper and backward portion.

[0041] Advantageously, the instrument has no resonance body.

[0042] Finally, the instrument of the present invention has a total length preferably less than 85 cm.

[0043] For a better understanding of the present invention, a preferred embodiment is now described, by way of a non-limiting example only, with reference to the following attached figures, in which:

- figures 1a, 1b and 1c illustrate in plan view an electric bass according to the present invention with five, four and six strings respectively;
- figures 2a, 2b and 2c show a comparison between the bass fretboard of the present invention and that of a traditional bass, respectively in the five-string, four-string and six-string version;

- figures 3a, 3b and 3c show respectively - in frontal view - the use of the bass of the present invention from the sitting position, the use of a traditional bass from the sitting position with support on the right leg and the use of a traditional bass from the sitting position with support on the left leg,
- Figures 3d and 3e show respectively the use of the bass of the present invention and a traditional bass from the upright position, in frontal view; and
- Figures 3f and 3g show respectively the use of the bass of the present invention and a traditional bass from the upright position, in view from above.

[0044] With reference to Figure 1a, a stringed musical instrument, in particular an electric bass, made according to the present invention, is indicated as a whole with 1.

[0045] The electric bass 1 comprises a body 2, a neck 3 that extends from body 2 along a direction D, a headstock 4 that extends from the neck 3 also along the direction D, a fingerboard 5 made partly on body 2 and partly on the neck 3, and a set of strings 6 that extend substantially along the entire instrument in the D direction and are arranged in sequence from a highest string 6a to a lowest string 6b. The bass 1 shown in figure 1a comprises five strings.

[0046] Figure 1b shows a first variant of the bass of the present invention, indicated with 1', comprising a set of strings 6' formed by four strings. Figure 1c shows a second variant of the bass of the present invention, denoted by 1", comprising a set of strings 6" formed by six strings. Besides from the number of strings, the bass 1' and 1" are identical to the bass 1, so the rest of the numbering has been omitted. The rest of the description will refer to the bass 1 of Figure 1a, but any consideration that follows will apply equally to the bass 1' and 1".

[0047] The body 2 and the neck 3 can be made in a single piece or be separate components assembled together with techniques of known type, for example with screws or glue, while the fingerboard 5 is preferably glued on the neck 3 and the headstock 4 is preferably made of one piece with neck 3.

[0048] The body 2 is preferably made of solid wood and not hollow wood, in several layers or in a single piece, and can be covered with a covering varnish, or be finished with wax or satin paint. However, body 2 can also be made of other materials, such as carbon. Similarly, the neck 3 is preferably made of wood, in a single piece or in overlapping layers to increase its stability, but can possibly be made of other materials.

[0049] On the front surface of body 2 (i.e. the one shown in the figure) is fixed an element 7 called bridge, substantially rectangular in shape, on which the strings 6 are anchored. The bridge 7 extends along a direction perpendicular to the direction D or, more preferably, along a direction slightly inclined from the vertical to direction D (as shown in figure 1a). In addition, bridge 7 comprises support elements of the strings 6 called saddles (not shown), whose position is adjustable both in height and longitudinally, to be able to adjust the height of the strings and the fine adjustment of the bass intonation. The bridge 7 is preferably made of wood or metal, but other materials can also be used.

[0050] On body 2 there are also tuning machines 8 of known type, to which the first ends of the strings 6 are fixed, while the second end of the strings 6 are fixed to the headstock 4. Through the tuning machines 8 the player can adjust the tension of the strings 6 in order to tune them. Each of the tuning machines 8 comprises a screw (not shown) with a housing for the first end of the string associated with it. Thanks to the rotation of the screw the desired tension of the string is achieved.

[0051] On body 2 are preferably present one or more transducers 9 of known type, called "pickup", able to transform the vibrations of the strings into impulses of electrotype.

[0052] Bass 1 could include an electronic part of a known type (not illustrated), for the preamplification and variation of the sound with suitable potentiometers.

[0053] The fingerboard 5 has a main surface facing the strings 6, on which it is possible to press the strings 6 to vary the intonation of the notes produced. This surface is preferably made of wood or carbon.

[0054] The fingerboard 5 is preferably equipped with frets 10, defined (as in most electric basses) by respective metal bars inserted in the fretboard 5 perpendicular to the direction D. Each fret 10 defines the advancement of a half step of a note produced from the previous fret. In one possible embodiment, the bass 1 comprises twenty-one frets, but this number can vary, preferably remaining in the range of nineteen to twenty-four. In a further embodiment, the bass 1 could have no frets, so-called "fretless" bass.

[0055] As known, the frets 10 are counted starting from the end of the fingerboard 5 opposite the body 2, on the side of the headstock 4. On this end of the fingerboard 5, before the first fret, there is a nut 11, which has the task of keeping the strings 6 raised from the fingerboard 5 itself, thus defining the starting point of the vibrating part of the strings 6, as well as keeping them appropriately spaced from each other. Nut 11 extends along a direction substantially orthogonal to direction D.

[0056] The distance between bridge 7 and the nut 11 defines the diapason or scale of the instrument, i.e. the length of the vibrating part of the strings. With greater precision, a scale is the distance between the parts of the bridge and the nut that support the strings. In the case of the bridge these parts are the saddles that house the strings.

[0057] According to the present invention, the bass 1 is sized in such a way to have a much smaller scale than a traditional bass but at the same time the same register as a traditional bass. In this way the bass 1 can have much

smaller longitudinal dimensions, but similar register, than a standard bass. In particular, the bass 1 has a scale between 55,6 cm and 59,6 cm, preferably between 56,6 cm and 58,6 cm, more preferably equal to about 57,6 cm. In addition, the bass 1 has a total length preferably less than 85 cm, more preferably less than 80 cm, for example equal to 79 cm.

[0058] To understand the difference between bass 1 and traditional bass, reference is made to Figure 2a, which shows, from top to bottom:

- the fingerboard of a standard four-string electric bass with twenty-four frets, having a typical scale of about 87 cm;
- the fingerboard of a standard five-string electric bass with twenty-four frets, having a typical scale of about 87 cm; and
- the fingerboard of bass 1 with five strings and twenty-one frets.

[0059] In Figure 2a, the strings are numbered from the highest string (the highest in the figure) to the lowest one (the lowest in the figure).

[0060] As can be seen in figure 2a, in a standard four-stringed bass the open strings will play the notes Sol, Re, La, Mi, while in a standard five-stringed bass the open strings will play the notes Sol, Re, La, Mi, Si. In practice, therefore, the difference between a standard five-string bass and a standard four-string bass is the presence of a lowest fifth string tuned on Si.

[0061] According to the present invention, the distance between the nut 11 and the bridge 7 in the bass 1 is equivalent to the distance between the seventh fret and the bridge in a standard bass (four or five strings), as shown in figure 2a. In other words, taking as a reference the bass bridge and considering the distance from it, in the bass 1 the nut 11 has the same position as the seventh fret of a standard bass, the first nut has the same position as the eighth nut of a standard type bass, the second nut has the same position as the ninth nut of a standard bass, and so on. In practice, the frets from the first to the seventeenth of the bass 1 have the same distance from the bridge of the frets from the eighth to the twenty-fourth of a standard type bass (which is indeed equipped with twenty-four frets).

[0062] For the purposes of the present invention, when we talk about the distance from the bridge or the nut we mean the distance from the fixed elements of the bridge or, respectively, of the nut, which support the strings. So, in the case of the bridge, we refer to the saddles.

[0063] Preferably, bass 1 comprises additional frets in addition to the seventeenth (therefore beyond the point where in a standard bass the frets end), to provide a greater number of playable notes on the fingerboard. In the embodiment shown in figure 2a, the bass 1 comprises a total of twenty-one frets, so there are four more in addition to the seventeenth. It is possible to have an even greater number of frets, but since the distance between contiguous frets decreases progressively, the movement of the player's fingers (particularly in the case of an adult) would be progressively more difficult.

[0064] Considering the above scale reduction of the instrument, with a string tension equal to that which allows you to have the notes Sol, Re, La, Mi in a standard four-string bass and the notes Sol, Re, La, Mi, Si in a standard five-string bass, the open strings of the bass 1 will play the notes Fa#, Si, Mi, La, Re.

[0065] Although, as previously described, the position of the nut 11 with respect to the bridge 7 in the bass 1 corresponds to that of the seventh fret in a standard bass, the bass 1 is preferably used with a different tension of the strings 6, more preferably lower, than the one that would allow to have - when the instrument is tuned - the same notes at the nut as at the seventh fret in a standard electric bass. In particular, in a preferred embodiment, the tension of the strings 6 of bass 1 is reduced by two semitones compared to the one that would allow to have at the nut the same notes as at the seventh fret in a standard electric bass, obtaining this way at the nut the same notes as at the fifth fret of a standard electric bass.

[0066] Thanks to the phase shift that is achieved by this reduction of two semitones, the note at the nut of the fifth string (i.e. the lowest string) of bass 1 corresponds to the note at the nut of the fourth string of a standard four-string bass, i.e. a low Mi. In practice, the string that in a five-string bass is normally used for the low Si will play a low Mi, that is, five semitones above. As a result, the string normally used for the low Mi will play a La, the string normally used for the La will play a Re, the string normally used for the Re will play a Sol and the one normally used for the Sol will play a high Do. Then, in the bass 1 of figure 2a, the five strings, moving from the highest string 6a to the lowest 6b, will play notes Do, Sol, Re, La, Mi.

[0067] Figure 2b shows a comparison between the fingerboard of a standard bass with four string and twenty frets (like that of a famous Fender brand model), the fingerboard of a standard bass with four string and twenty-four frets and the fingerboard of bass 1' with four string and twenty-one frets. Using the same logic of the bass 1 with five strings, the high open string of bass 1' with four strings, normally used for the Re, will play a Sol, so that the four strings of bass 1' will play notes Sol, Re, La, Mi as a traditional four-string bass.

[0068] Figure 2c shows a comparison between the fingerboard of a standard bass with six strings and twenty-four frets and that of the bass 1" with six strings and twenty-one frets. In the bass 1" the high string, normally used for the Do, will play a Fa, so that the six strings will play the notes Fa, Do, Sol, Re, La, Mi.

[0069] These notes are associated with their respective vibration frequencies as follows:

- Fa (F): 174.6 Hz
- Do (C): 130.8 Hz
- Sol (G): 98 Hz
- Re (D): 73.4 Hz
- La (A): 55 Hz
- Mi (E): 41.2 Hz

[0070] With reference again to figure 2a, bass 1 with five strings and twenty-one frets, thanks to the lowering of two semitones on each string, the lower note obtained on string 6b will be the Mi, while the highest note on the string 6a will be a high La at the twenty-first fret. Considering that the traditional basses arrive, on the Sol string, to a note between a Re at the nineteenth fret (for nineteen-fret basses) to a Sol at the twenty-fourth fret (for twenty-four-fret basses), the bass 1 with five strings and twenty-one frets has between two and five semitones above a traditional electric bass. As for bass 1' with four strings and twenty-one-fret (figure 2b) a register is obtained that starts from a low Mi on the lowest string 6b to get to a high Mi on the highest string 6a at the twenty-first fret. Finally, in the bass 1" with six strings and twenty-one-fret (figure 2c) a register is obtained that starts from a low Mi on the lowest string 6b to get to a high Re on the highest string 6a at the twenty-first fret.

[0071] As is known, the diameters of the different strings can vary within predetermined intervals in order to meet the different needs of the players. The string set can in fact vary from the so-called "extra-light", from the smaller diameter, more "agile" and controllable to the touch, up to the so-called "heavy" ones, for more "robust" sounds. In Table 1, purely indicative (taken from the site https://didatticadelbassoelettrico.it/), the typical diameters of different string set for a bass with a maximum of five strings are shown.

Table 1

I corda SOL (G)		II corda RE (D)	III corda LA (A)	IV corda MI (E) V corda SI (B)	
EXTRA LIGHT	0,030"/0,76mm	0,050"/1,27mm	0,070"/1,77mm	0,090"/2,28mm	0,110"/2,79mm
	0,035"/0,88mm	0,055"/1,39mm	0,075"/1,90mm	0,095"/2,41mm	0,115"/2,92mm
LIGHT	0,040"/1,01mm	0,055"/1,39mm	0,075"/1,90mm	0,095"/2,41mm	0,115"/2,92mm
	0,040"/1,01mm	0,060"/1,52mm	0,080"/2,03mm	0,100"/2,54mm	0,120"/3,04mm
MEDIUM	0,045"/1,14mm	0,065"/1,65mm	0,080"/2,03mm	0,100"/2,54mm	0,120"/3,04mm
	0,045"/1,14mm	0,065"/1,65mm	0,085"/2,15mm	0,105"/2,66mm	0,125"/3,17mm
HEAVY	0,050"/1,27mm	0,070"/1,77mm	0,090"/2,28mm	0,110"/2,79mm	0,128"/3,30mm
	0,055"/1,39mm	0,075"/1,90mm	0,095"/2,41mm	0,115"/2,92mm	0,135"/3,42mm

[0072] The string diameters of bass 1 can therefore vary in the following intervals:

- Sol string tuned to Do: between 0.030" (0.76 mm) and 0.045" (1.39 mm);
- Re string tuned to Sol: between 0.050" (1.27 mm) and 0.075" (1.90 mm);
- La string tuned to Re: between 0.070" (1.77 mm) and 0.095" (2.41 mm);
- Mi string tuned to La: between 0.090" (2.28 mm) and 0.115" (2.92 mm);
- Si string tuned to Mi: between 0.110" (2.79 mm) and 0.135" (3.42 mm);

[0073] However, it is clear that the strings of the same set will preferably be of the same type, i.e. either all Extra Light, or all Light, or all Medium, or all Heavy, and will therefore have the diameters indicated in one of the lines of Table 1.

[0074] The diameter of the lowest string 6b of the bass of the present invention, both in the five-string version and in the four- or six-string version, is therefore between 2.79 mm and 3.42 mm. As already explained, the lower string 6b is always tuned to Mi.

[0075] In addition, the bass 1 preferably includes the same string set (i.e. the same range of string set diameters) as a standard five-string bass, i.e. the string set 45-125, which corresponds to a typical Medium string set. In particular, the preferred size of the five strings of the bass 1 is the following:

- Sol string tuned to Do: 0.045 "(about 1.118 mm);
- Re string tuned to Sol: 0.065 "(about 1.651 mm);
- La chord tuned to Re: 0.085 "(about 2.154 mm);

- Mi string tuned to La: 0.105 "(about 2.667 mm);
- Si string tuned to Mi: 0.125 "(about 3.175 mm).

[0076] The distance between consecutive strings along the fingerboard 5 decreases progressively moving from the nut 11 to the bridge 7. The distance of the strings with respect to the nut is regulated by the following equation: $X_n=L(1-1/r^n)$, where:

- n is the number of the string considered, counting the strings starting from the nut;
- X_n is the distance of the n fret from the nut;
- L is the scale of the instrument, which previously explained, corresponds to the distance between the fret and the nut and is between 55.6 cm and 59.6 cm (for example equal to 57.6 cm); And
- r is a constant equal to $2^{(1/12)}$.

[0077] It should be borne in mind that the above equation is affected by a certain degree of error due to two factors:

- the approximation of the direction of the bridge 7 to orthogonal to the direction D, i.e. parallel to the nut 11; in fact, as shown in figure 1a, the bridge 7 is oriented slightly oblique with respect to a straight line orthogonal to the direction D;
- the height of the strings 6 with respect to the fingerboard 5.

[0078] The following table 2 shows, for bass 1 having a scale of 57.6 cm, the approximate distance of each fret 10 from the nut 11 and from the previous fret (i.e. the width of the fret):

Table 2

Fret	Distance from the nut (mm)	Distance from previous fret (mm)
1	32,33	32,33
2	62,84	30,51
3	91,64	28,8
4	118,83	27,18
5	144,49	25,66
6	168,7	24,22
7	191,56	22,86
8	213,14	21,57
9	233,51	20,36
10	252,73	19,22
11	270,87	18,14
12	288	17,12
13	304,16	16,16
14	319,42	15,25
15	333,82	14,4
16	347,41	13,59
17	360,24	12,82
18	372,35	12,11
19	383,78	11,43
20	394,57	10,79
21	404,75	10,18

[0079] So, summing up, bass 1 includes five standard strings Sol, Re, La, Mi, Si, but due to the reduced scale and

the lowering of two semitones these strings will tune the notes Do, Sol, Re, La, Mi respectively. In practice, the fingerboard 5 has a much shorter length than the fingerboard of a traditional bass but a similar arrangement of notes, simply offset by a string. In particular, compared to a standard four-string bass it is as if a higher string (the string 6a) had been added, tuned to Do, but with the described advantages of a much smaller scale and a much shorter fingerboard. A skilled player accustomed to a traditional four-string bass can therefore easily adapt himself to the bass of the present invention.

[0080] In the four-string bass 1', on the other hand, the same open strings are obtained as a standard four-string bass, but with all the advantages described below relating to the smaller size of the instrument. As for the six-string bass 1", compared to a standard four-string bass it is as if two higher strings were added tuned to Do and Fa, but with the same advantages described above.

[0081] The particularly small size of the bass 1 makes it more manageable and ergonomic than a standard bass, reducing the opening of the arms (especially the left arm for right-handers and the right arm for left-handers) and also the opening between the fingers of the left hand (thanks to the smaller spacing of the frets). These small dimensions of the instrument also make it suitable for use by children or people with short upper limbs. The mutual spacing between the strings 6 near the bridge 7 however remains unchanged with respect to traditional basses, thus giving an expert player the possibility of not having to modify the technique and perception of the right hand.

[0082] In order to obtain an even better ergonomics of the instrument, the body 2 has a particular conformation, which makes it easier to use the instrument from the seated position. As illustrated in Figure 1a, the body 2 has a lower and backward portion (i.e. further away from the neck 3) 2a and a lower and frontward portion (i.e. closer to the neck) 2b. In a standard electric bass, the lower portion furthest away from the neck has a convex shape. In the bass 1, the lower and backward portion 2a has a hollow (or recess) 2c which defines a concave surface. In other words, the lower and backward portion 2a has a concave profile (i.e. a surface with concavity facing outwards) instead of the traditional convex profile. The recess 2c is made with such a geometry as to be suitable for resting on a player's leg.

[0083] The lower and anterior portion 2b also has a recess 2d which defines a concave surface with the concavity facing outwards. In the solution shown in Figure 1a, the concavity of the recess 2d is even more accentuated than that of the recess 2c.

[0084] The two lower portions 2a and 2b, and therefore the two concave surfaces 2c and 2d, are preferably connected by means of a corner portion 2e (i.e. a pointed portion), which defines also the lowest part of the instrument when this is arranged with the neck 3 horizontal.

[0085] The upper part of the body 2 can be shaped like that of a standard bass, or have a profile of a different shape. In the embodiment of figure 1a, in an upper portion 2f further away from the neck 3 there is a further recess 2g of a shape and size similar to the recess 2b, to further reduce the weight of the instrument and to confer a certain symmetry at the same.

[0086] Again with reference to figure 1a, approximate measurements of the bass 1 in one possible embodiment are indicated below:

- distance d_1 between bridge and nut (corresponding to the scale L of the instrument): 57.6 cm;
- length d_2 of the headstock 4: 11.5 cm;
- height d_3 of body 2 (along a direction orthogonal to direction D): 34 cm
- total length d_4 of the bass 1: 79 cm
- distance between strings 6 on bridge 7: 19 mm
- distance between the strings on the nut 11: 8 mm.

[0087] Figures 3a to 3g show how the reduced size of the instrument and the presence of the 2c recess contribute to better ergonomics and handling of the instrument, compared to a traditional bass guitar (for the comparison a Fender branded standard bass was considered).

[0088] In particular, figures 3a, 3b and 3c show respectively - in front view - the use of the bass 1 from the seated position, the use of a traditional bass from the seated position with support on the right leg and the use of a traditional bass from the seated position with support on the left leg; Figures 3d and 3e show respectively - in front view - the use of the bass 1 and a traditional bass from the upright position; and Figures 3f and 3g show respectively - in top view - the use of the bass 1 and a traditional bass from the upright position. All views refer to the use of the instrument by a right-handed player.

[0089] In figure 3a it can be seen how, thanks to the recess 2c, the bass 1 can be comfortably placed on the player's right leg and, from the comparison with figure 3d, how the bass itself appears to have substantially the same centering and the same inclination when it is played in a sitting or standing position.

[0090] From an ergonomic point of view, the centrality of the instrument avoids twisting of the spine, which happens with traditional basses when the body of the instrument is placed on the left leg as shown in figure 3b (which is why classical guitarists are forced to use the footrest for the left leg), but even more so when it is placed on the right leg as shown in figure 3c. In particular, when a bass with a traditional profile is placed on the left leg, the neck is particularly

far from the player's body, creating a distancing of the left arm from the player's body which increases its leverage.

[0091] Figures 3a, 3d and 3f instead show how in the bass 1 the arm and the hand that operate on the fingerboard are in a much more comfortable position and close to the player's body (therefore less tiring to maintain) than the one with a standard bass guitar (figures 3b, 3c, 3e, 3g). In practice, with the bass 1 the arm that operates on the fingerboard has a lower opening than the player's body, with the result of a smaller lever and a more perpendicular direction of the forearm with respect to the neck, thus improving ergonomics.

[0092] Furthermore, the small size and the presence of the recess contribute to making the instrument lighter and easier to handle, both while it is being played and when traveling or moving.

[0093] The smaller spacing of the frets contributes to greater manageability and allows greater speed in using the instrument, as well as a greater choice of different fingerings, thus making the bass of the present invention also suitable for children. The shorter fret spacing also allows the player more creativity in terms of fingerings and chord building.

[0094] Finally, the particularly small dimensions of the instrument and, therefore, the lower need for material for its manufacture, make it more economical and ecological in the production phase.

[0095] Finally, it is clear that modifications and variations can be made to the stringed musical instrument described and illustrated here without thereby departing from the scope of the present invention.

[0096] For example, the bass of the present invention can be made (according to an embodiment not shown) with the tuning machines on the headstock 4 instead of on the body 2. In this case the tuning machines include elements called pegs or clefs in equal numbers to the number of strings, around which the ends of the strings are wound. The pegs or frets are rotatable around their own axis to allow the application of the desired tension to the strings.

Claims

1. Stringed musical instrument (1, 1', 1"), made of a body (2), a neck (3) extending in one direction (D) from the body, a set of strings (6, 6', 6") arranged in sequence from a highest string (6a) to a lowest string (6b), a first string support element (7) is located on the body (2) and a second string support element (11) is located on the neck (3), the distance (d_1) between the first and the second string support element (7, 11) defining the maximum vibration length of the strings, **characterized in that** the distance between the first and the second string support element (7, 11) is between 55,6 cm and 59,6 cm, the diameter of the lowest string (6b) is between 2,79 mm and 3,42 mm and the note emitted by the lowest string (6b) when it is vibrated as open string is E.

2. Instrument according to claim 1, **characterized in that** the distance between the first and the second string support element (7, 11) is between 56,6 cm and 58,6 cm.

3. Instrument according to claim 1 or 2, **characterized in that** it includes a fingerboard (5) comprising a plurality of frets (10), wherein the number of frets (10) is between seventeen and twenty-four.

4. An instrument according to any one of the preceding claims, **characterized in that** the strings (6) are five and that the note emitted by the highest string (6a) when it is vibrated as open string is a C.

5. Instrument according to any one of the claims from 1 to 3, **characterized in that** the strings (6') are four and that the note emitted by the highest string (6a) when it is vibrated as open string is a G.

6. Instrument according to any one of the claims 1 to 3, **characterized in that** the strings (6") are six and that the note emitted by the highest string (6a) when it is vibrated as open string is a F.

7. Instrument according to any one of the preceding claims, **characterized in that** the body (2) has, in a lower and rear portion (2a) thereof, a concave surface (2c) with the concavity facing the outside of the body (2).

8. Instrument according to claim 7, **characterized in that** the first string support element (7) extends along a direction which intersects said concave surface (2c).

9. Instrument according to claim 7 or 8, **characterized in that** the body (2) has, in a lower and front portion (2b) thereof, another concave surface (2d) with the concavity facing the outside of the body (2), joined to said concave surface (2c) by an edge portion (2e).

10. Instrument according to any of the preceding claims, **characterized in that** the instrument (1, 1', 1") is an electric bass.

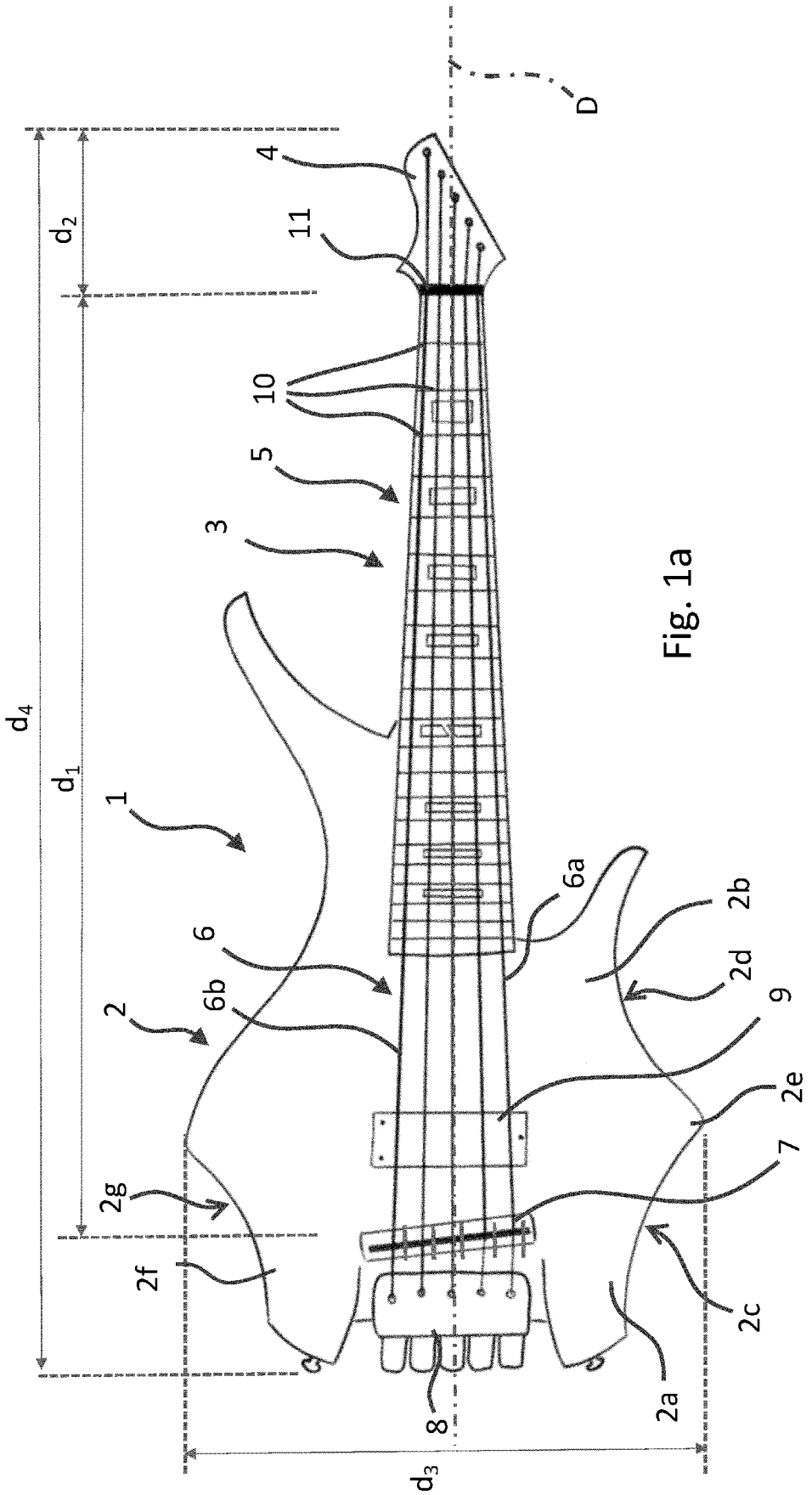

Fig. 1a

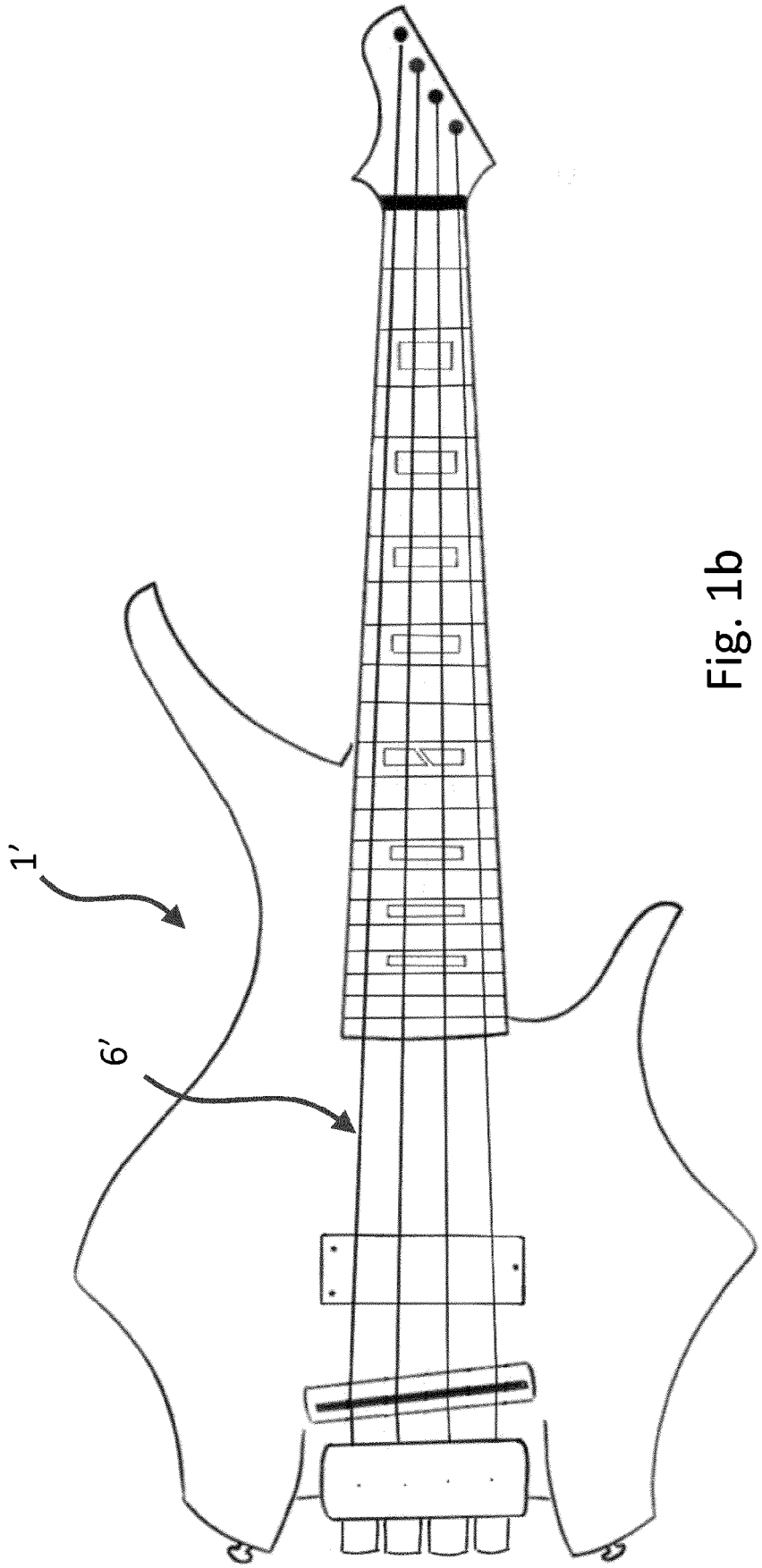

Fig. 1b

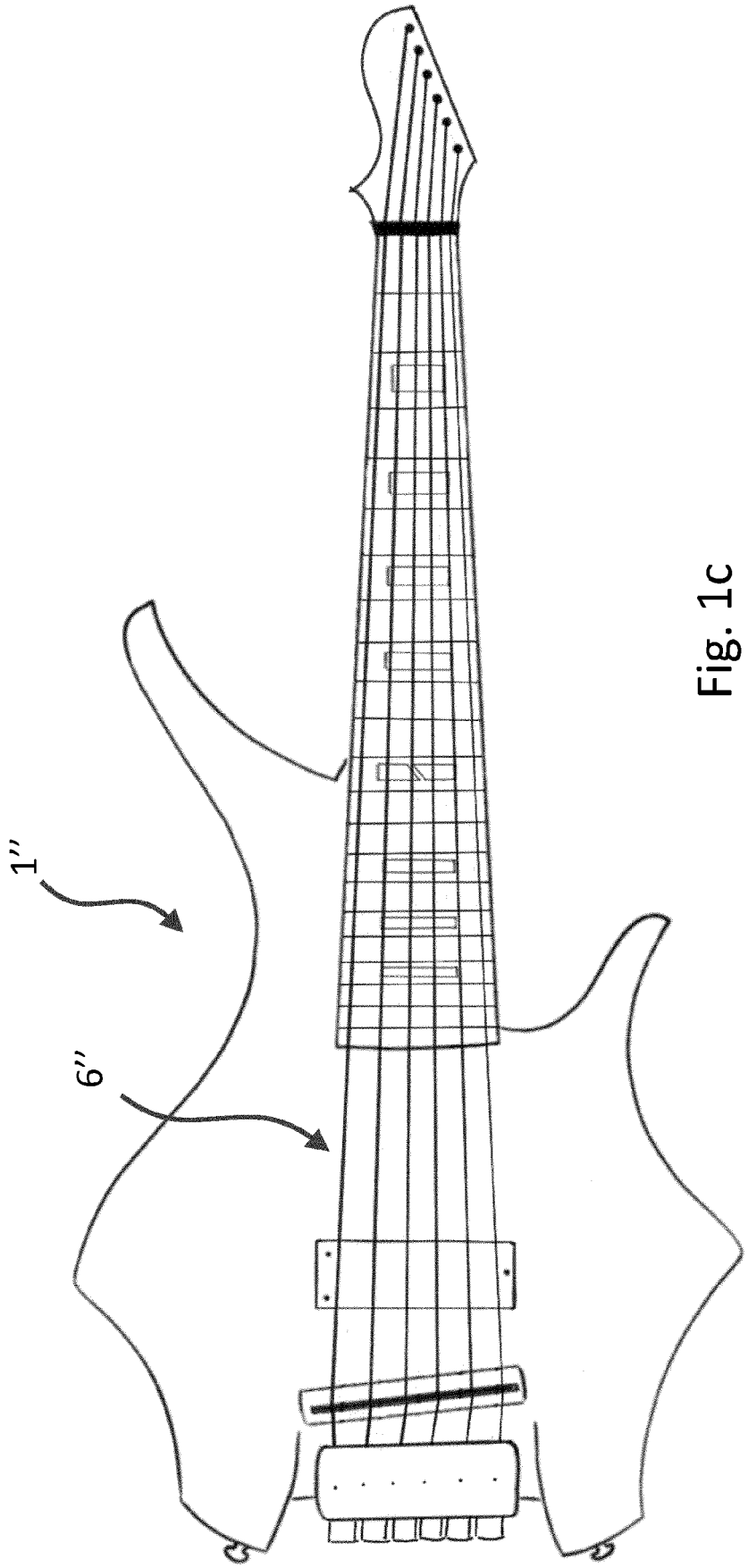

Fig. 1c

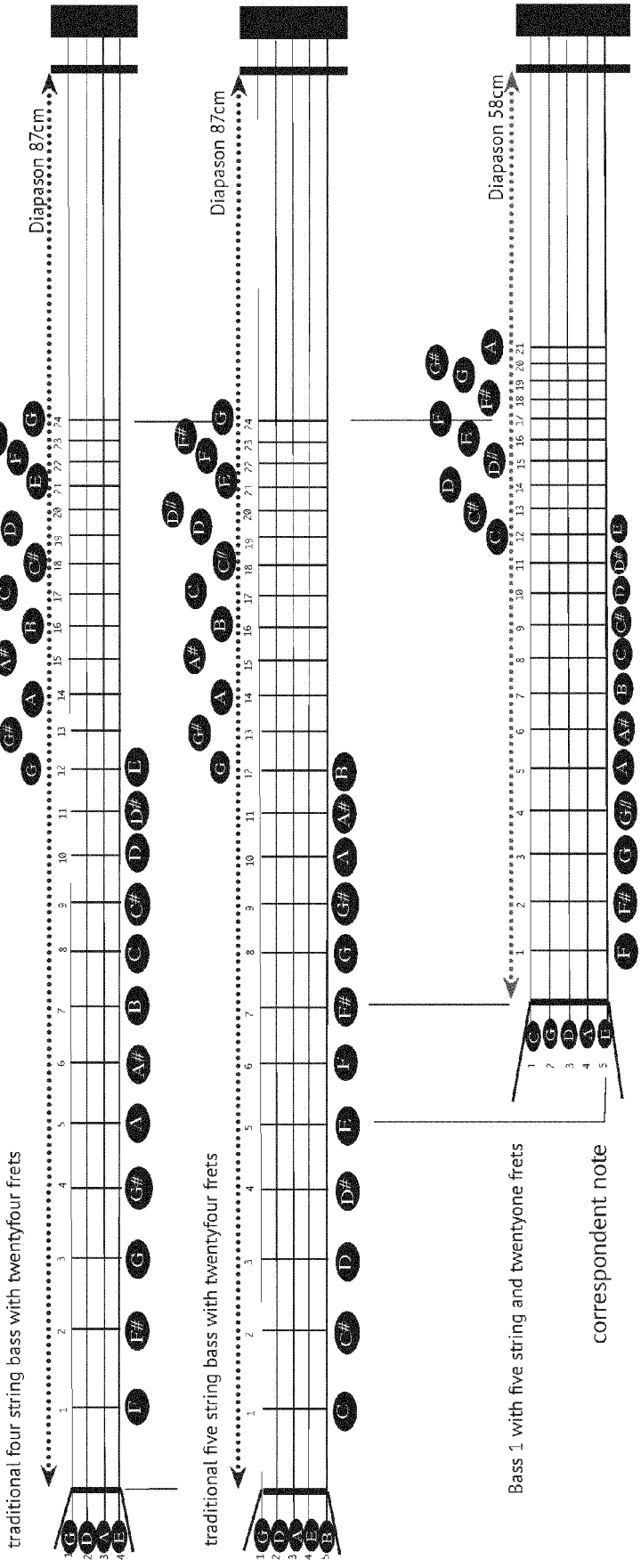
traditional four string bass with twentyfour frets
Diapason 87cm
traditional five string bass with twentyfour frets
Diapason 87cm
Bass 1 with five string and twentyone frets
Diapason 58cm
correspondent note

Fig.2a

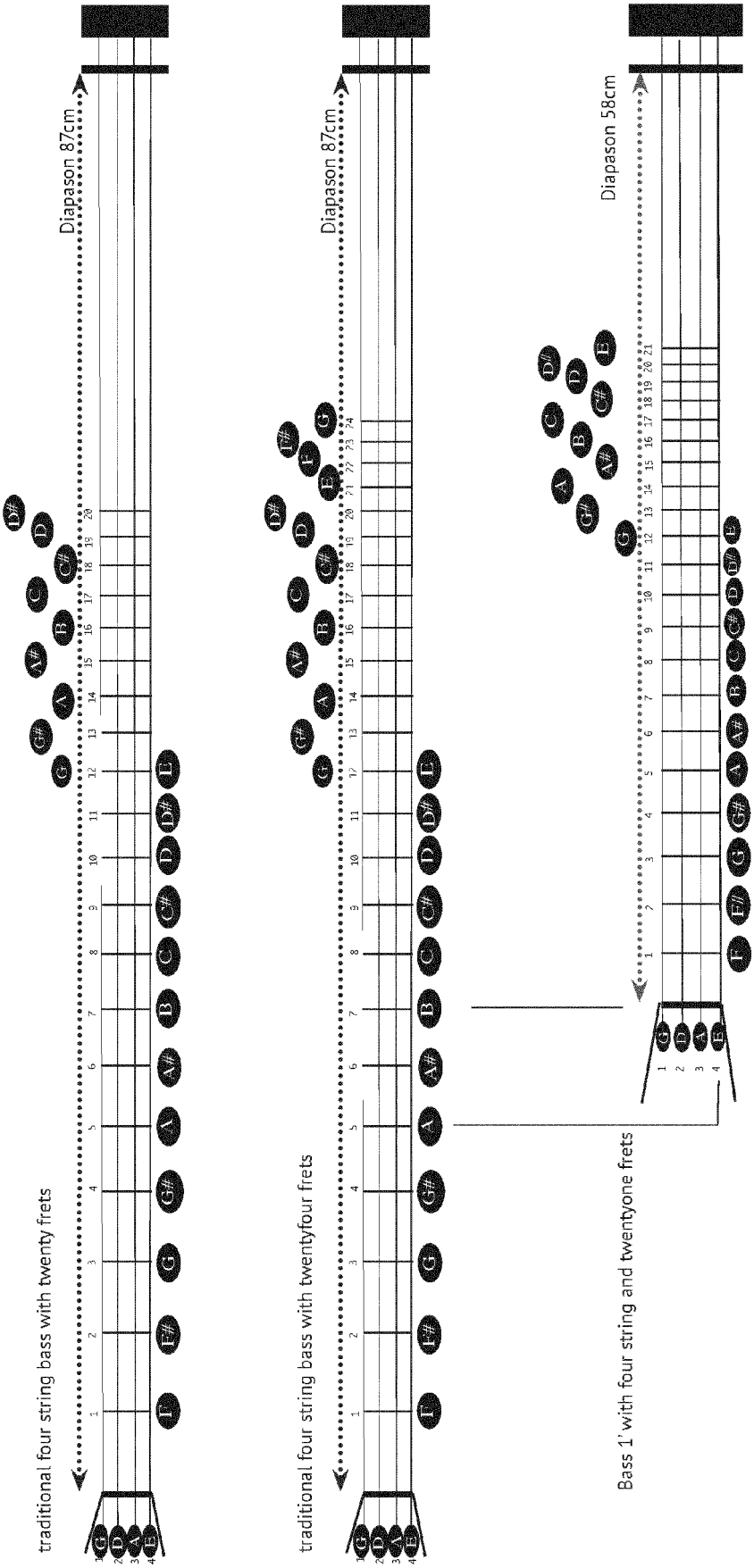
traditional four string bass with twenty frets
Diapason 87cm
traditional four string bass with twentyfour frets
Diapason 87cm
Bass 1' with four string and twentyone frets
Diapason 58cm

Fig.2b

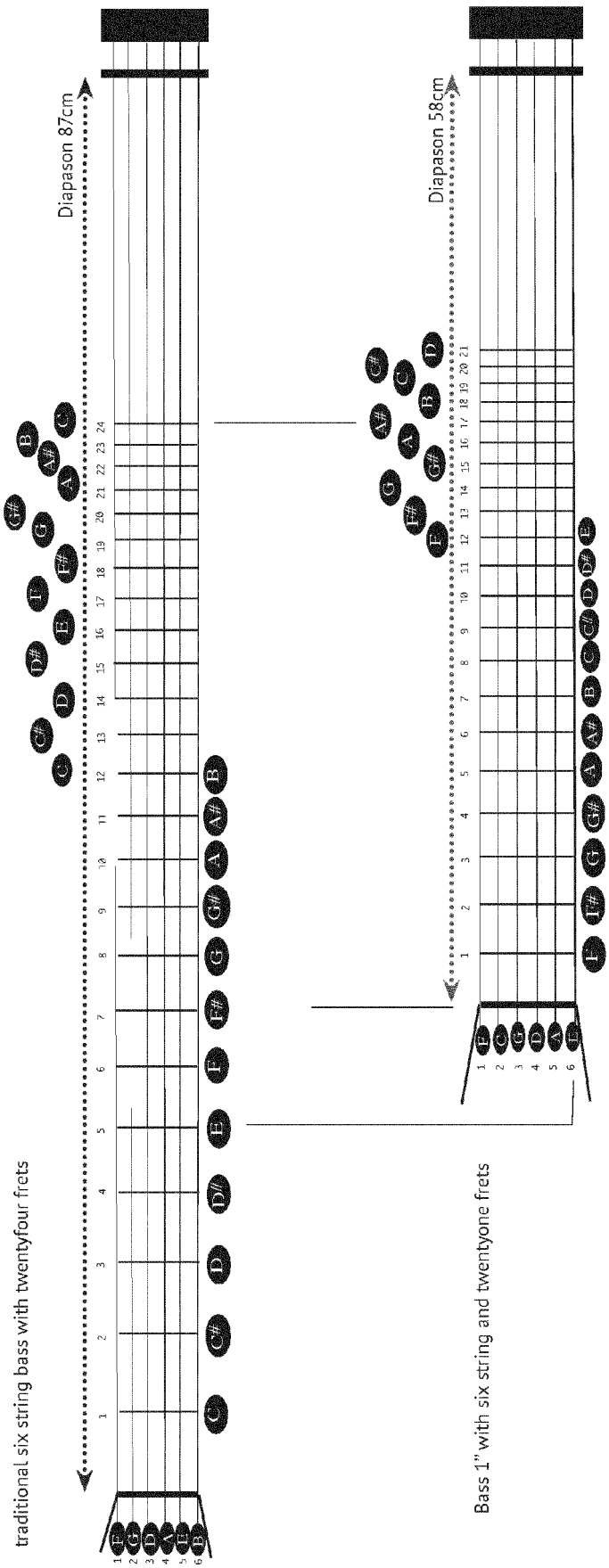
Diapason 87cm
Diapason 58cm
traditional six string bass with twentyfour frets
Bass 1" with six string and twentyone frets

Fig.2c

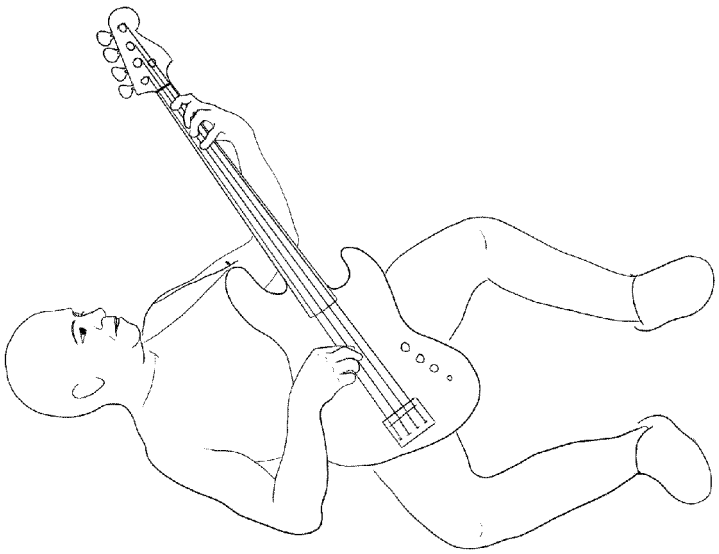

Fig. 3c

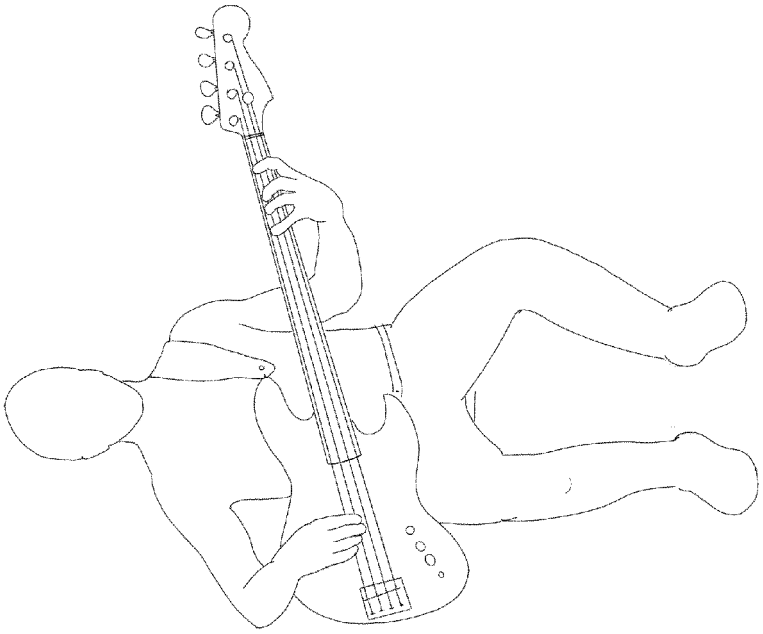

Fig. 3b

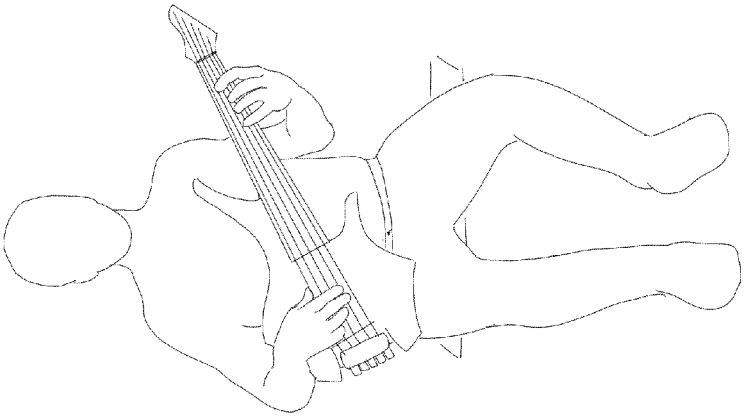

Fig. 3a

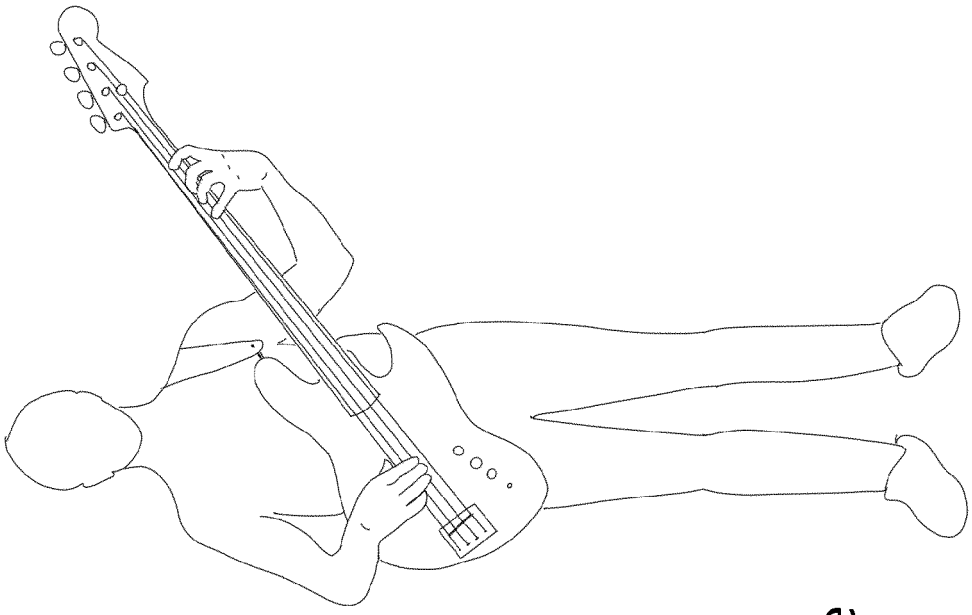

Fig. 3e

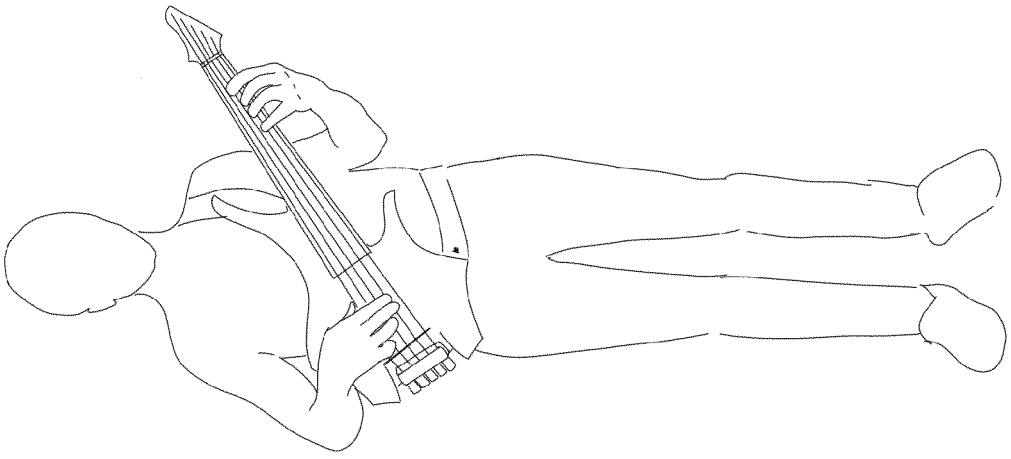

Fig. 3d

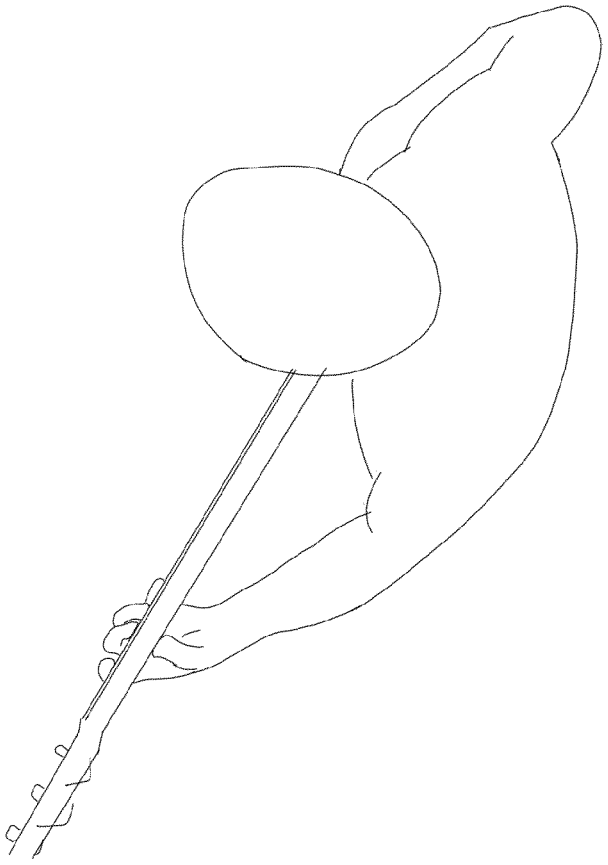

Fig. 3g

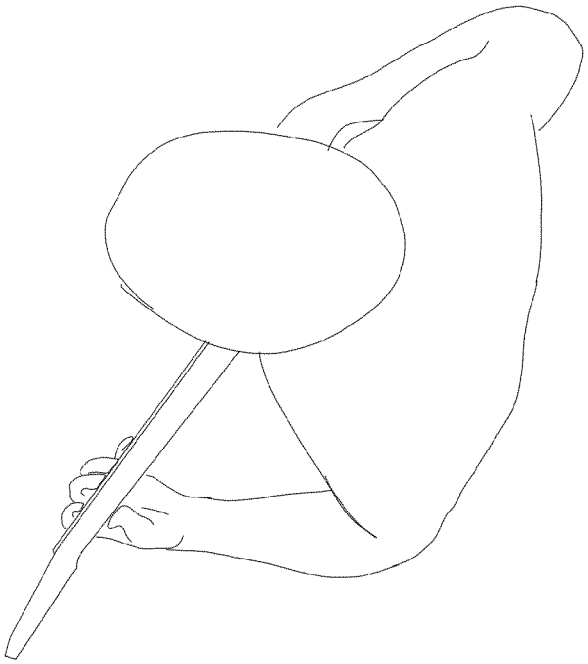

Fig. 3f

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EUROPEAN SEARCH REPORT

Application Number
EP 21 00 0339

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
Y	The Loog Guitar: "Loog Guitars Kickstarter Video (2019)", , 1 September 2019 (2019-09-01), page 1, XP054982062, Retrieved from the Internet: URL:https://www.youtube.com/watch?v=oOMH0ndlZNw [retrieved on 2021-07-19]	1-9	INV. G10D1/08 G10D3/06
A	* the whole document *	10	
Y	Anonymous: "Loog Pro Electric VI, Green ¦ Gear4music", , 1 September 2019 (2019-09-01), pages 1-4, XP055825105, Retrieved from the Internet: URL:https://www.gear4music.fr/fr/Guitare-and-Basse/Loog-Pro-Electric-VI-Green/3R8U?origin=product-ads&gclid=EAIaIQobChMIn5Wdrabn8QIVIgCiAx3nhQCtEAQYAiABEgLXE_D_BwE [retrieved on 2021-07-16] * page 3 *	1-9	TECHNICAL FIELDS SEARCHED (IPC) G10D
Y	Anonymous: "Le youtubeur Davie504 monte des cordes de basses sur une guitare, et ça sonne ! - Audiofanzine", , 1 January 2017 (2017-01-01), XP055825055, Retrieved from the Internet: URL:https://fr.audiofanzine.com/guitare-electrique/news/a.play,n.35961.html [retrieved on 2021-07-16] * page 1 *	1-9	
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The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	8 April 2022	Lorne, Benoît

CATEGORY OF CITED DOCUMENTS

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08-04-2022

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For more details about this annex : see Official Journal of the European Patent Office, No. 12/82

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