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

(11) EP 0 911 800 A1

(12) EUROPEAN PATENT APPLICATION

(43) Date of publication:
28.04.1999 Bulletin 1999/17

(51) Int. Cl.[6]: **G10D 3/00**

(21) Application number: **97830544.9**

(22) Date of filing: **24.10.1997**

(84) Designated Contracting States:
AT BE CH DE DK ES FI FR GB GR IE IT LI LU MC NL PT SE
Designated Extension States:
AL LT LV RO SI

(71) Applicant: **Hohenegger, Alexander**
00153 Roma RM (IT)

(72) Inventor: **Hohenegger, Alexander**
00153 Roma RM (IT)

(74) Representative:
Bazzichelli, Alfredo et al
c/o Società Italiana Brevetti S.p.A.
Piazza di Pietra, 39
00186 Roma (IT)

(54) String instrument

(57) A string instrument (1) with a simple structure capable of being dismantled, which makes it possible to generate high quality sounds while at the same time allowing a wide range of adjustments to adapt to a variety of musical needs, comprises an harmonic bearing structure (3) with a rigid strut element (18), arranged longitudinally and capable or bearing a compression deriving from the tension in the strings (8), a tie rod (21), of variable length, distinct from said at least one strut element (18) and capable of bearing a traction deriving from the tension in the strings (8), a sound board (19), capable of receiving said vibrations from the bridge (15), which is structurally independent of said at least one strut element (18) and said at least one tie rod (21), the length of the tie rod (21) being variable when said at least one tie rod (21) is not subjected to traction, so as to move the fingerboard (6) and a corresponding taught portion (16) of the strings (8) closer together and further apart.

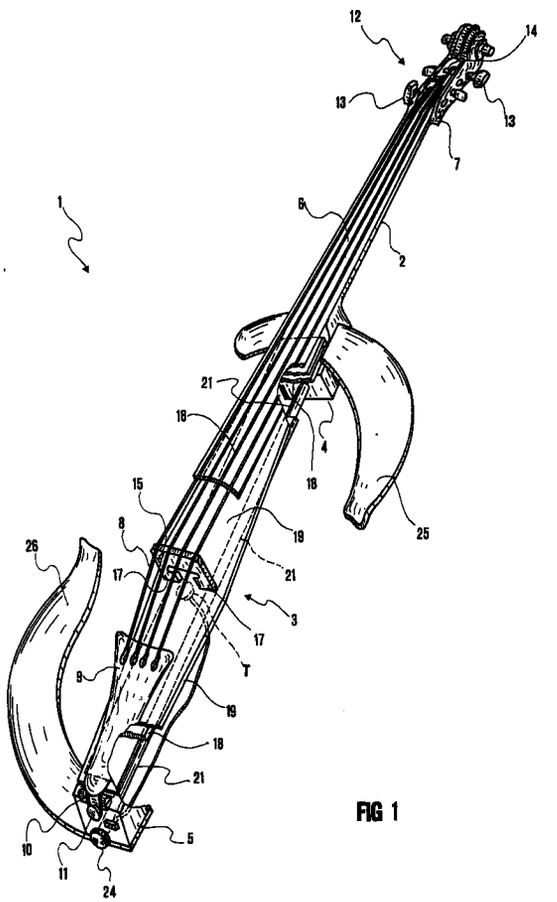

FIG 1

EP 0 911 800 A1

Description

[0001] The present invention relates to a string instrument of the hand held type, such as a violin or viola, or of the upright type, such as a violoncello or double-bass, suitable to be played in a traditional manner, using the hands or a bow, and suitable to be electrically amplified and dismantled.

[0002] It is a well-known fact that traditional string instruments are the result of the knowledge of craftsmen that dates back centuries. The purity of tone is the result of care for a number of details, for example the thickness and quality of the wood used, the angle of the strings, the form of the resonant parts and so on.

[0003] From a strictly mechanical point of view, sound is generated thanks to vibration of the walls of the hollow bearing structure forming the body of the instrument. This vibration, which is suitably damped and amplified by the harmonic box formed by said structure, is transmitted to the vibrating walls, known as harmonic plates, according to the vibrations imparted to the strings by the player and transmitted to the walls through the bridge.

[0004] It is also important to note that the bearing structure, as well as generating the sound, has the job of supporting the compression and traction stress caused by the tension to which the strings of the instrument are subjected.

[0005] On the basis of the above considerations it is easy to understand that said bearing structure, and as a consequence the whole instrument, is particularly delicate, as it has to perform both acoustic and purely structural functions simultaneously. It is therefore necessary to handle the instrument with extreme care, obviously also bearing in mind the cost of an object of this kind.

[0006] As regards upright instruments, the bearing structure is also heavy and voluminous, which further increases the care that has to be taken of the instrument and which, in addition to this, results in considerable transport expenses.

[0007] To solve these problems, string instruments with structural characteristics different from those of traditional instruments have been introduced, thanks to which it is possible to handle the various parts with greater ease, substantially reducing the risk of damage and manufacturing costs.

[0008] Structural simplification has made it possible to manufacture string instruments that can be dismantled, have a smaller volume and can be more easily put away into cases.

[0009] These non-traditional instruments have not been designed to replace classical instruments, but to make available to the public instruments suitable for beginners, amateurs or even professional players who, as well as a traditional instrument, wish to own a string instrument that is both easy to carry and strong, suitable for use when studying and practising.

[0010] However, the above aims are rendered for the most part useless unless the quality of sound produced is not sufficiently similar to that of a traditional instrument, and if the instrument is not sufficiently versatile and adjustable so as to adapt to the various requirements of each player.

[0011] String instruments are known that can be dismantled and that have a completely rigid bearing structure. They are provided with acoustic transducers which collect the vibrations produced by the strings, instead of a vibrating wall which in this case is not present, according to the same principle used in electric guitars and basses.

[0012] This type of instrument, however, does not reach a sound quality of a type that can be compared with that of a traditional instrument, because the sound is generated by means, the strings, that differ from those of a traditional instrument.

[0013] String instruments have also been provided that can be dismantled, in which the sound is generated according to the mechanisms of a traditional instrument, that is to say by a vibrating wall, which in turn receives vibrations from the strings through the bridge of the instrument.

[0014] This type of instrument, although it has a better sound quality, does not give the freedom of adjustment that would be expected by the user for an instrument that is easy to transport and manage, and therefore capable of adapting to a variety of different musical situations.

[0015] The technical problem at the root of the present invention is that of providing a string instrument that makes it possible to overcome all the various problems mentioned with reference to the prior art.

[0016] This problem is solved by a string instrument comprising:

a neck supporting a fingerboard;
a plurality of strings capable of being subjected to tension and of being stretched between a tail-piece and one end of the neck, said fingerboard being arranged in a position immediately below a taught portion of said plurality of strings;
a front block, to which said neck is rigidly connected;
a rear block, to which said finger-board is connected;
means to adjust the tension of each string;
a bridge on which said plurality of strings rests, to transmit the vibrations thereof;
an harmonic bearing structure, substantially arranged between said front and rear block, comprising:

- at least one rigid strut element, arranged longitudinally and capable of supporting a compression resulting from the tension of said plurality of strings;
- at least one tie rod, of variable length, distinct

from said at least one strut element and capable of supporting a traction deriving from the tension of said plurality of strings, extending substantially between said front and rear blocks;

- at least one sound board, capable of receiving said vibrations from said bridge, structurally independent from said at least one strut element and said at least one tie rod element; and

means for adjusting the length of said at least one tie rod, that can be operated when said at least one tie rod is subjected to traction, to bring together or move apart said fingerboard and said taught portion of said plurality of strings.

[0017] The main advantage of the string instrument according to the present invention lies in the fact that it allows generation of a high quality sound in a structurally simple instrument that can be dismantled, while at the same time allowing a wide range of adjustments to adapt to a variety of musical needs.

[0018] The present invention will be described with reference to two preferred embodiments thereof, relating to a hand held instrument and to an upright instrument, respectively, given merely as a non-limiting example. Reference will be made to the figures of the enclosed drawings, in which:

figure 1 shows a perspective view, partially in cross-section, of a hand held string instrument according to the present invention;
figure 2 shows a side elevation view, partially in cross-section, of the string instrument of figure 1;
figure 3 shows a perspective view, partially in cross-section, of an upright string instrument according to the present invention;
figure 4 shows a side elevation view, partially in cross-section, of the string instrument of figure 3; and
figure 5 shows a perspective view of an alternative detail of the upright string instrument of figure 3.

[0019] With particular reference to figures 1 and 2, a hand held string instrument, and in particular a violin, is indicated as a whole with 1. It is of the type suitable to be played in a traditional manner using a bow, not shown, or plucked so as to play "pizzicato".

[0020] The violin 1 comprises a neck 2, capable of being normally gripped in the left hand of the musician, and a harmonic bearing structure 3, which forms the body of the instrument, capable of resting between the base of the neck and the chin of the musician while playing.

[0021] The violin 1 further comprises a front block 4, to which the neck 2 is rigidly connected, and a rear block 5. The harmonic bearing structure 3 is thus substantially arranged between said blocks 4, 5 which represent the structural elements to which the strings are anchored to cross the neck 2 and fingerboard, as will be seen from the following.

[0022] The neck 2 carries a fingerboard 6, rounded in form, which extends longitudinally along the whole of the neck 2 and also partially over the structure 3.

[0023] The neck 2 also comprises a terminal scroll 7, of a traditional shape, which forms one end of the neck of the instrument 1, to which are fixed a plurality of strings 8 which, in the present embodiment, number four. Said strings 8 extend from the scroll 7 to a tail-piece 9, also with a substantially traditional form, which is connected to the rear block 5 by means of a tie 10 hooked around a button 11, which in turn is fixed into the back of the rear block 5.

[0024] The tail-piece 9 is thus free to incline and rotate with respect to the rear block 5.

[0025] The strings 8 are capable of being subjected to tension, and in this regard the violin 1 comprises adjustment means 12 for the tension of each string 8. In the present embodiment said adjustment means 12 are located on the scroll 7, which has a plurality of keys 13, each one of which corresponds to a respective string 8 and has a stem 14 around which the string 8 is wrapped.

[0026] The violin 1 comprises a bridge 15 resting against said plurality of strings 8. The bridge is arranged perpendicular to an axis substantially defined by the scroll 7 and by the tie 10, which form the ends of an arch over which the strings 8 are held taught. The position of the bridge 15 with respect to said axis forms an angle of deviation that represents an important acoustic parameter for the violin 1.

[0027] The strings 8, suitably diverted, and said axis form a symmetrical tension plane that is substantially perpendicular to the violin 1 as a whole and to the planes defined by the fingerboard 6 and by the strings 8, respectively, on the one side, and with respect to the bridge 15 on the other side.

[0028] Due to the effect of the tension in said plurality of strings 8, the fingerboard 6 is arranged in a position immediately underlying a taught portion 16 of said plurality of strings 8. The taught portion 16 is substantially comprised between the scroll 7 and the bridge 15, and on it the musician plays the violin using his fingers or the bow.

[0029] The distance between the strings 8 and the fingerboard 6 is also an important parameter: in effect when the strings 8 and the fingerboard 6 are very close it is not possible to excerpt a strong pressure on the strings 8, because in this way they would touch the surface of the fingerboard 6.

[0030] The bridge 15 is made to rest, in correspondence with a pair of feet 17, on the bearing structure 3 in the way that will be described in the following, and transmits the vibrations imparted to the strings 8 by the musician to said bearing structure.

[0031] The harmonic bearing structure 3 comprises,

between the blocks 4, 5 and fixed thereto, a rigid strut element 18, of wooden material such as maple or the like, and substantially in the shape of a beam arranged to lie flat with respect to the violin 1 as a whole.

[0032] The strut element 18 is arranged along said axis between the scroll 7 and the button 11, so that it is able to support an axial compression deriving from the tension excerpted on the strings 8.

[0033] It has a cross section with horizontal dimensions, that is to say those perpendicular to the plane of tension of the strings 8, that are greater than the vertical dimensions. In this way the strut element 18 offers greater resistance to the lateral flexing stress that might be created if the strings 8 are unevenly or excessively tightened.

[0034] In correspondence with the front block 4, the strut element 18 is fixed by means of a horizontal pin 28, adjacent to the internal edge of the block 4, and by means of vertical screws 29, arranged on the end of the strut element 18 in a central position with respect to the block 4.

[0035] During assembly, after fixing the horizontal pin 28 around which the strut element 18 is free to rotate, it is possible to provide wooden spacers or wedges between the strut element 18 and the front block 4, in order to roughly determine the distance between the strings 8 and the fingerboard 6. Once said spacers have been adjusted, the strut element 18 is finally fixed in place by means of the vertical screws 29.

[0036] In an intermediate position between the strings 8 and the strut element 18, the bearing structure 3 has a sound board 19 which extends along the whole of the structure 3 and simply rests on the blocks 4, 5 in correspondence with resting points 20, so that it is compressed between the bridge 15 and the blocks 4, 5 and remains floating with respect to the latter.

[0037] The sound board 19, which is structurally independent of the strut element 18 and is bellied in shape, is not subjected to shear stress but only to the action of the bridge, from which it receives the vibrations generated by the strings. In this way the board 19 forms a resonating body free of structural stress.

[0038] An acoustic transducer T is applied to the sound board 19 in correspondence with the bridge 15, picking up the sound made by the violin at the point in which it is generated, that is to say on the sound board 19.

[0039] The acoustic transducer T transforms the vibrations in the sound board 19 into an electric signal which can be amplified using normal systems. An acoustic transducer particularly suitable for use in a violin according to the present embodiment of the invention is the pick-up described in the U.S.A. Patent No. 5,461,193 (Schertler). This operates according to an electrostatic and electrodynamic principle according to the movement of an electric coil with respect to a permanent magnet integral with the vibrating body.

[0040] The bearing structure 3 further comprises a tie rod 21 with a variable length, distinct from said strut element 18, substantially extending between the front and rear blocks 4, 5. The sound board 19 is in any case structurally independent of the tie rod 21.

[0041] The tie rod 21 rests on said tension plane and is below the axis defined by the scroll 7 and the button 11. Because of its position it is therefore capable of supporting the traction deriving from the tension created in said plurality of strings 8.

[0042] The tie rod 21, which has a rigid tubular structure, is fixed to the front block 4 and, in correspondence with the rear block 5, has a threaded end 22, in particular with an external thread, engaged with screw means comprising an internally threaded sleeve 23. The sleeve 23 extends from the back of the block 5 in the form of a handle 24, for said screw means, which can be turned in a clockwise or in an anti-clockwise direction.

[0043] It is also possible to opt for an internal thread on the tie rod 21, controlled by screw means made up of a threaded pin with an external handle or other element for the activation thereof.

[0044] The threaded end 22, the sleeve 23 and the handle 24 constitute means to vary the length of said tie rod 21 when the latter is subjected to traction. By shortening the tie rod 21 the strut element 18 is bent and the blocks 4, 5 are made to rotate with respect to one another. Due to this movement enforced by the tie rod 21 the neck 2 is turned in the direction indicated by the arrow in figure 2 and the taught portion 16 of the strings 8 and the fingerboard 6 are brought closer to one another.

[0045] For the same reason the angle of deviation determined by the bridge 15 also decreases in size and, for an equivalent tension in the strings 8, the sound board 19 is subjected to a higher pressure.

[0046] On the contrary, if the tie rod 21 is extended, the strings 8 and the fingerboard 6 are moved apart, the angle of deviation increases in size and pressure is released from the sound board 19.

[0047] The combined action of adjustment means 12 and the variation in length of the tie rod 21 thus offers a wide range of adjustments in sound which render the violin 1 capable of adapting to every instrumental need.

[0048] To the front block 4 and the rear block 5, respectively, are fixed in a removable manner a front curved element 25 and a rear curved element 26, which simulate the external shape of a traditional violin.

[0049] The front curved element 25 forms a raised plane, close to the plane substantially defined by the board 19, in a position such that is forms a reference point for the arm holding the bow.

[0050] In a similar manner the rear curved element forms a lowered plane, corresponding to the base plate of a traditional violin, providing a reference point when resting the instrument 1 against the base of the neck.

[0051] The rigid parts of the violin 1, the blocks 4 and 5, the strut element 18, the neck 2, can conveniently be made of a more rigid type of wood, for example maple.

The sound board 19 can be made of a type of wood with distinctive sounding characteristics, for example Norway spruce. Ebony is preferred for the fingerboard.

[0052] The conformation of the board 19 allows the greatest possible freedom for the violin maker when selecting the thickness that will give the best sound.

[0053] The curved elements 25, 26 are fixed to the respective blocks by means of screws 27, and can therefore be dismantled. Likewise the sound board 19, after the strings 8 have been loosened, is no longer subjected to compression by the bridge 15 and can therefore be removed, and if necessary replaced by a board with different acoustic characteristics.

[0054] The bridge 15 is also easy to replace and its position on the board 19 can also be changed.

[0055] The violin 1 described above can be subject to a number of variations, which however remain within the scope of the present invention.

[0056] In particular, it can be fitted with more than one strut element 18, or with more than one tie rod 21, provided these are structurally symmetrical, so that they can be subjected to the respective compression and traction stress.

[0057] Furthermore, spacers can be provided in correspondence with the resting points 20 on the sound board 19, to modify the acoustic response of the latter and the geometry of the whole instrument.

[0058] It is also possible to equip the instrument 1 with a double sound board 19, comprising two parts in different materials and/or of a different thickness, so as to provide optimum response both in the high and low registers. In this regard the bridge 15 could rest on both the boards, arranged side by side, with one foot 17 on each of the boards.

[0059] Clearly, the present embodiment is not limited by the number of strings, which might, for example, be five instead of four. In a similar manner this embodiment can be equally applied to any hand held string instrument, for example a viola.

[0060] The whole instrument can in any case be customised, for example by using, for the neck, curved elements, bridge, distance between blocks, the measurements of a traditional instrument. The owner of said instrument could thus transfer to the dismountable instrument without noticing any difference in size.

[0061] With reference to figures 3 and 4, a second embodiment of a string instrument according to the present invention will be described, in an upright version and in particular in the form of a violoncello. In this embodiment technical solutions are used that differ in part from those described above, but that all fall within the scope of the same inventive concept.

[0062] It is also clear that said technical solutions are not limited to the type of instrument, whether hand held or upright, but can be fully interchangeable, obviously with an effect scaled to the smaller or larger instrument.

[0063] Corresponding components are given the same reference numbers.

[0064] In figures 3 and 4 a violoncello is thus indicated as a whole with 1. It comprises a neck 2, normally capable of being held in the left hand of the musician, and a harmonic bearing structure 3 capable of being inclined with respect to the body of the musician, who usually plays the instrument from a sitting position.

[0065] The violoncello 1 further comprises a front or top block 4, to which the neck 2 is rigidly connected, and a rear or bottom block 5. The harmonic bearing structure 3 is thus substantially arranged between said blocks 4, 5 and rests on the rear block 5, which has a through hole 30 and a ferrule 31, inserted in the hole, which is locked in position by a screw fixing element 32 which clamps the ferrule 31 in the hole 30.

[0066] The violoncello 1 can be rested on the ground on the ferrule 31, which can be adjusted to a suitable height.

[0067] The neck 2 carries a fingerboard 6, rounded in form, which extends longitudinally along the whole of the neck 2 and also partially over the structure 3.

[0068] The neck 2 also comprises a terminal scroll 7', which is turned in the opposite direction to the traditional one, that is to say it curls around towards the back of the violoncello 1 and not towards the front, thus extending the surface of the fingerboard 6.

[0069] This scroll 7' forms the end of the neck to which are fixed a plurality of strings 8 which, in the present embodiment also, number four. Said strings 8 extend from the scroll 7' to a tail-piece 9, also with a substantially traditional form, which is connected to the rear block 5 by means of a tie 10 hooked around a button 11, which in turn is fixed into the back of the rear block 5.

[0070] The strings 8 are capable of being subjected to tension, and in this regard the violin 1 comprises adjustment means 12 for the tension of each string 8. In the present embodiment said adjustment means 12 are located in correspondence with the tail-piece 9.

[0071] The instrument 1 comprises a bridge 15 resting against said plurality of strings 8. The bridge 15 is arranged perpendicular to the axis substantially defined by the scroll 7' and by the button 11, which form the ends of an arch over which the strings 8 are held taught.

[0072] In the case of the violoncello 1 the bridge 15 takes on a characteristic arched shape and has an opening 15a.

[0073] The strings 8, suitably diverted, and said axis form a symmetrical tension plane that is substantially perpendicular to the violoncello 1 as a whole and to the planes defined by the fingerboard 6 and by the strings 8, respectively, on the one side, and with respect to the bridge 15 on the other side.

[0074] Due to the effect of the tension in said plurality of strings 8, the fingerboard 6 is arranged in a position immediately underlying a taught portion 16 of said plurality of strings 8. The taught portion 16 is substantially comprised between the scroll 7' and the bridge 15, and on it the musician plays the instrument using his fingers, to play pizzicato, or the bow.

[0075] The bridge 15 is made to rest, in correspondence with a pair of feet 17, on the bearing structure 3 in the way that will be described in the following, and transmits the vibrations imparted to the strings 8 by the musician to said bearing structure.

[0076] The harmonic bearing structure 3 comprises, between the blocks 4, 5 and fixed thereto, a rigid strut element 18, substantially in the shape of a bar. On the front block 4 the strut element 18 is fixed into a corresponding cavity 33, while on the rear block 5 the strut element is anchored to a screw element 34 which is fixed into the block 5 at a variable height, so that the point of contact between block 5 and strut element 18 can vary in height.

[0077] The tail-piece 9 is connected, by means of the tie 10, directly to the end of the strut element 18 on the rear block 5. In this way, while it is mechanically connected to the block 5, the tail-piece follows the movements imposed on the strut element 18 by the screw element 34.

[0078] The strut element 18 is substantially arranged along said axis between the scroll 7' and the button 11, so that it is able to support an axial compression deriving from the tension excerpted on the strings 8.

[0079] Below the strut element 18, the bearing structure 3 provides a sound board 19, which extends along the whole of the structure 3 and is fixed to the blocks 4, 5. In particular the sound board 19 is also fixed to the screw element 34, between the strut element 18 and the rear block 5.

[0080] The position of the board 19 is such that, when the strings 8 are subjected to tension, a marginal amount of compression is discharged onto them, whereas most of the compression is loaded onto the strut element 18. In this way, the sound board 19, which is structurally independent of the strut element 18, is able to vibrate freely and, in this regard, is compressed between the bridge 15 and the blocks 4, 5.

[0081] The bridge 15, in the present embodiment, is arranged to straddle the strut element 18, which passes through the opening 15a.

[0082] An acoustic transducer T is applied to the sound board 19 in correspondence with the bridge 15, picking up the sound made by the violoncello 1 at the point in which it is generated, that is to say on the sound board 19. This transducer is similar to the one mentioned above with reference to the violin, only of a kind suitable to receive sounds of a lower pitch.

[0083] The bearing structure 3 further comprises a tie rod 21 with a variable length, distinct from said strut element 18, substantially extending between the front and rear blocks 4, 5.

[0084] The tie rod 21 rests on said tension plane and is below the axis defined by the scroll 7' and the button 11. Because of its position it is therefore capable of supporting the traction deriving from the tension created in said plurality of strings 8.

[0085] The tie rod 21, which has a rigid tubular structure, is fixed to the front block 4 and, in correspondence with the rear block 5, has a threaded end 22 in screw engagement with an internally threaded sleeve 23. The sleeve 23 extends from the back of the block 5 in the form of a handle 24, which can be turned in a clockwise or in an anti-clockwise direction.

[0086] The threaded end 22, the sleeve 23 and the handle 24 constitute means to vary the length of said tie rod 21 when the latter is subjected to traction. By shortening the tie rod 21 the strut element 18 is bent and the blocks 4, 5 are made to rotate with respect to one another. Due to this movement enforced by the tie rod 21 the neck 2 is turned in the direction indicated by the arrow in figure 4 and the taught portion 16 of the strings 8 and the fingerboard 6 are brought closer to one another.

[0087] For the same reason the angle of deviation determined by the bridge 15 also decreases in size and, for an equivalent tension in the strings 8, the sound board 19 is subjected to a higher pressure.

[0088] The sound board 19 also becomes more curved, and this can be compensated if necessary by adjusting the screw element 34.

[0089] On the contrary, if the tie rod 21 is extended, the strings 8 and the fingerboard 6 are moved apart, the angle of deviation increases in size and pressure is released from the sound board 19.

[0090] Likewise in the case of the violoncello and of upright string instruments in general, such as double-basses, the combined action of the adjustment means 12 and variation of the length of the tie rod 21 thus offers a wide range of acoustic regulation.

[0091] A front curved element 25 and a rear curved element 26 are fixed to the front block 4 and to the rear block 5, respectively, in a removable manner to simulate the external shape of a traditional violoncello.

[0092] Both the front curved element and the rear curved element define a lowered plane corresponding to the back board of a traditional violoncello, which provides a reference when resting the instrument 1 against the legs or body.

[0093] The rear curved element 26 extends symmetrically to both sides of rear block 5.

[0094] The curved elements 25, 26 are fixed to the respective blocks by means of screws, and can therefore be removed. Likewise in the case of the violoncello the bridge 15 can easily be replaced, and its position on the board 19 can also be changed.

[0095] The violoncello 1 described above can be subjected to various alterations similar to those already described above with reference to the violin, and in any case falling within the scope of the present invention.

[0096] With reference to figure 5, the end of a neck is now described, indicated as a whole with 35, adapted for preference to an upright string instrument.

[0097] It comprises a blade 36 arranged on end with respect to the fingerboard 6, in correspondence with which the means 12 adjusting the tension of each of the

strings 8 are located.

[0098] According to this embodiment, the violoncello 1, not shown in figure 5, comprises a tail-piece 9 of a traditional type and substantially as shown with reference to the violin of figures 1 and 2.

[0099] The adjustment means 12 comprise keys 13 which act on stems 14, to which the strings 8 are respectively fixed and around which they are wrapped, said keys protruding in an offset manner from the sides of the blade 36.

[0100] This type of end on the neck increases the structural simplicity of the instrument and makes it easier to store.

[0101] As well as the advantage mentioned above, the string instruments described above can be handled like traditional instruments, and it is possible to obtain similar sensations from them, both in terms of sound, behaviour and size.

[0102] The hand-held instruments have a weight similar to that of a traditional hand-held string instrument, which facilitates their use. On the contrary, as regards upright string instruments, in which a similarity of this kind is of no practical use, as the instrument is not borne by the musician, the weight is conveniently reduced.

[0103] Furthermore, the sound can be amplified in any manner and can be heard by the musician through earphones. The instrument is therefore suitable to be used in a wide range of occasions, for example in a study or hotel room at times in which silence is expected.

[0104] An expert in the field would be able to make a number of further modifications and variations to the string instruments described above, in order to satisfy further needs and special requirements, and all of said modifications and alterations fall within the scope of protection of the present invention, as defined in the enclosed claims.

Claims

1. A string instrument (1) comprising:

   a neck (2) supporting a finger board (6);
   a plurality of strings (8) capable of being subjected to tension and extending between a tail-piece (9) and an end (7, 7', 35) of the neck, said fingerboard (6) being arranged in a position immediately underlying a taught portion (16) of said plurality of strings (8);
   a front block (4) to which said neck (2) is rigidly connected;
   a rear block (5) to which said tail-piece (9) is connected;
   means (12) for adjustment of the tension in each string (8);
   a bridge (15) resting against said plurality of strings (8) to transmit the vibration thereof;
   an harmonic bearing structure (3), substantially arranged between said front and rear blocks (4, 5), comprising:

   - at least one rigid strut element (18), arranged longitudinally and capable of bearing a compression deriving from the tension in said plurality of strings (8);
   - at least one tie rod (21), of variable length, distinct from said at least one strut element (18) and capable of bearing a traction deriving from the tension in said plurality of strings (8), extending substantially between said front and rear blocks (4, 5);
   - at least one sound board (19), capable of receiving said vibrations from said bridge (15), structurally independent of said at least one strut element (18) and said at least one tie rod (21); and

   means (22, 23, 24) for adjusting the length of said at least one tie rod (21), which can be operated when said at least one tie rod (21) is subjected to traction, to move said fingerboard (6) and said taught portion (16) of said plurality of strings (8) closer together or further apart.

2. A string instrument (1) according to claim 1, comprising a strut element (18) arranged substantially in axis with the end of the neck (7, 7', 35) and a tie (10), by means of which the tail-piece (9) is connected to the back of the rear block (5).

3. A string instrument (1) according to claim 1, comprising a tie rod (21) arranged below an axis defined by the end of the neck (7, 7', 35) and a tie (10), by means of which the tail-piece (9) is connected to the back of the rear block (5).

4. A string instrument (1) comprising an acoustic transducer (T) applied to said at least one sound board (19) in correspondence with said bridge (15).

5. A string instrument (1) according to claim 1, comprising curved elements (25, 26) protruding from the front and rear blocks (4, 5) to simulate the external shape of a traditional string instrument.

6. A string instrument (1) according to claim 5, in which said curved elements (25, 26) can be dismantled.

7. A string instrument (1) according to claim 1, in which said at least one tie rod (21) has a threaded end (22) engaged with screw means (23, 24).

8. A string instrument (1) according to claim 7, in which said screw means are arranged in correspondence with the rear block (5).

9. A string instrument (1) according to any one of claims 1 to 8, in which said at least one sound board (19) is arranged so as to rest on said front and rear blocks (4, 5), being free from shear stress and floating on said front and rear blocks (4, 5).

10. A string instrument (1) according to claim 9. in which said at least one sound board (19) is in an intermediate position between the strings (8) and said at least one strut element (18).

11. A string instrument (1) according to claim 9. in which said means (12) for adjustment of the tension in each string are located on a scroll (7) which forms said end of the neck.

12. A string instrument (1) according to any one of claims 1 to 8, in which said at least one sound board (19) is arranged below said strut element (18) with respect to said strings (8).

13. A string instrument (1) according to claim 12, in which the bridge (15) is arranged to straddle said at least one strut element (18).

14. A string instrument (1) according to any one of claims 1 to 8, in which said at least one strut element (18) is anchored to a screw element (34) fixed to the rear block (5), so that the point of contact between the rear block (5) and at least one strut element (18) can vary in height.

15. A string instrument (1) according to any one of claims 1 to 8, in which said at least one sound board (19) is fixed to the front and rear blocks (4, 5).

16. A string instrument (1) according to claims 13 and 14, in which said at least one sound board (19) is fixed to the rear block (5) by means of said screw element (34).

17. A string instrument (1) according to any one of claims 9 to 16, in which the means (12) for adjustment of the tension in each string are located on the tail-piece (9).

18. A string instrument (1) according to any one of claims 9 to 16, in which the means (12) for adjustment of the tension in each string are located in correspondence with said end of the neck (35), which comprises a blade (36) arranged on end with respect to the fingerboard (6), said means (12) for adjustment comprising keys (13) which act on respective stems (14) protruding sideways in an offset manner from the blade (36).

19. A string instrument according to claim 16, in which said tail-piece (9) is connected, in correspondence with the rear block (5), directly to the end of the strut element (18) by means of the tie (10).

20. A string instrument (1) according to any one of the preceding claims, in which, in correspondence with the front block (4), the strut element (18) is fixed by means of a horizontal pin (28) adjacent to the inner edge of the block (4), and by means of one or more vertical screws (29) arranged on the end of the strut element (18).

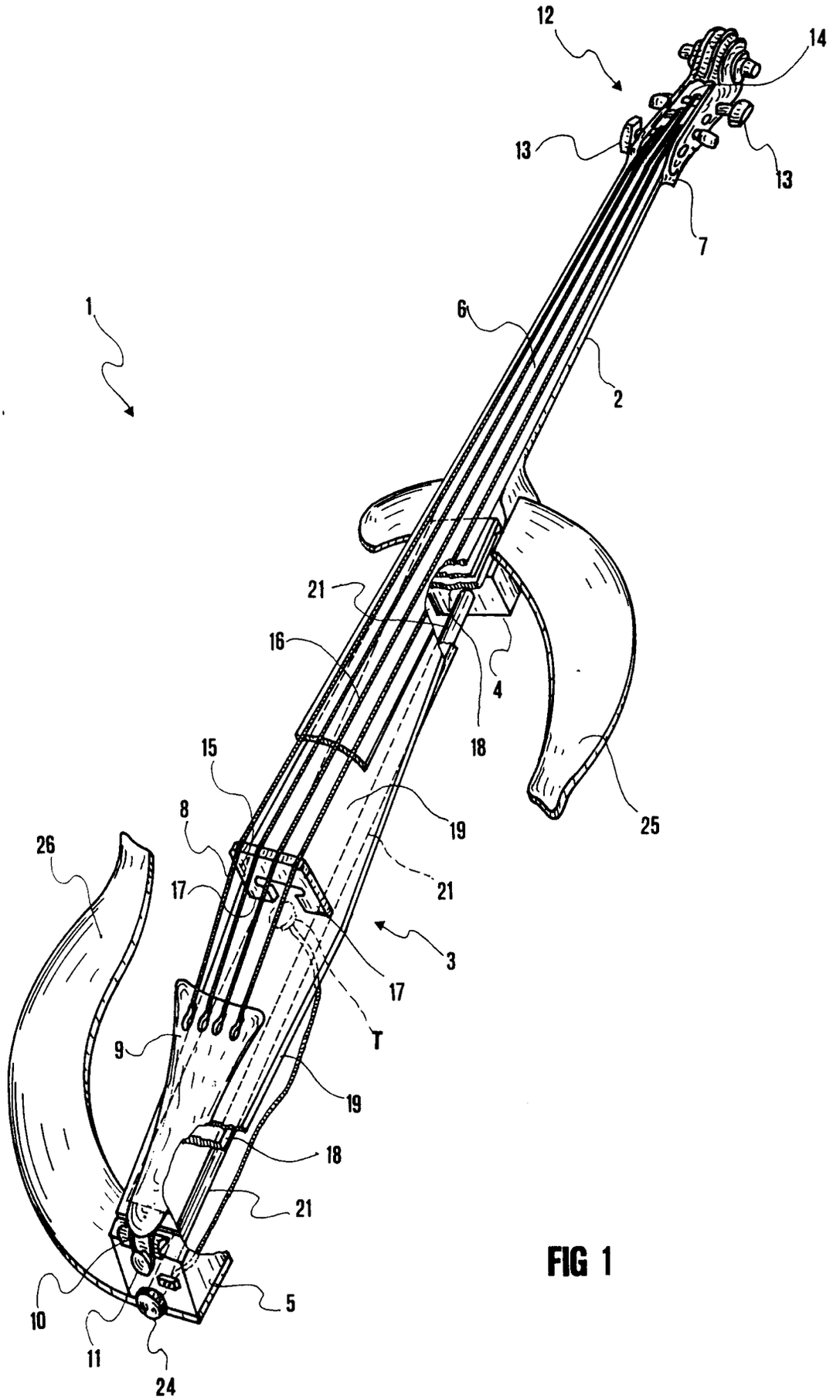
12
14
13
13
7
1
6
2
21
16
4
18
15
19
25
8
26
17
21
3
17
T
9
19
18
21
5
10
11
24

FIG 1

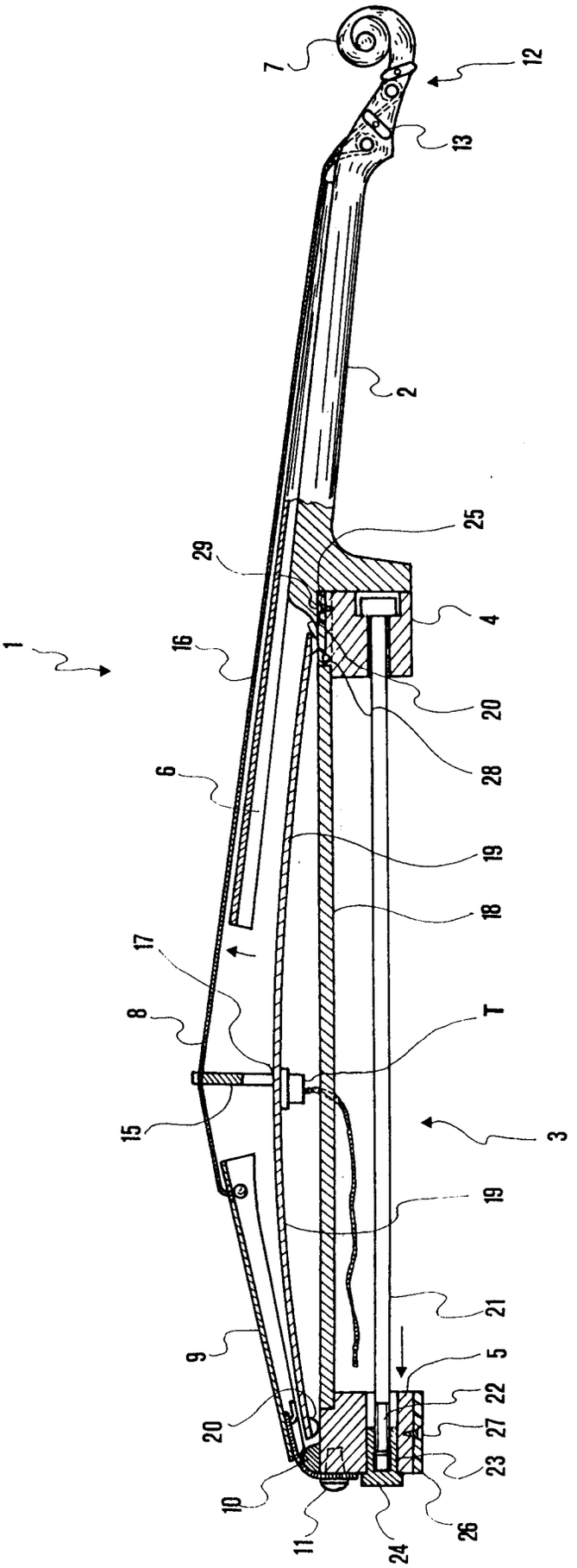
7
12
13
2
25
29
4
1
16
20
28
6
19
18
17
8
T
15
3
19
21
9
5
22
20
27
23
10
11
24
26

FIG 2

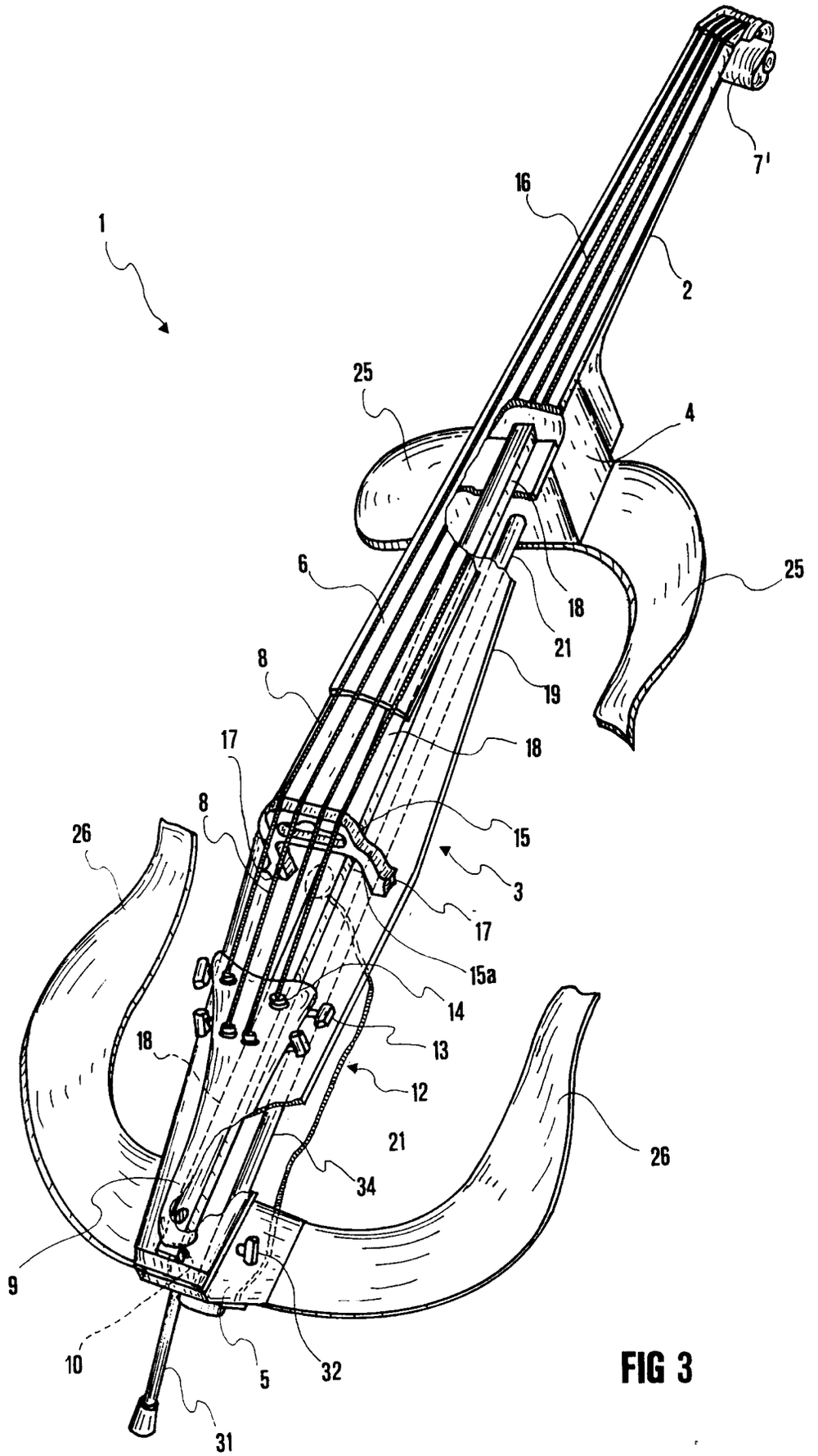
1
7'
16
2
25
4
6
18
25
21
8
19
17
18
8
15
26
3
17
15a
14
18
13
12
21
26
34
9
10
5
32
31

FIG 3

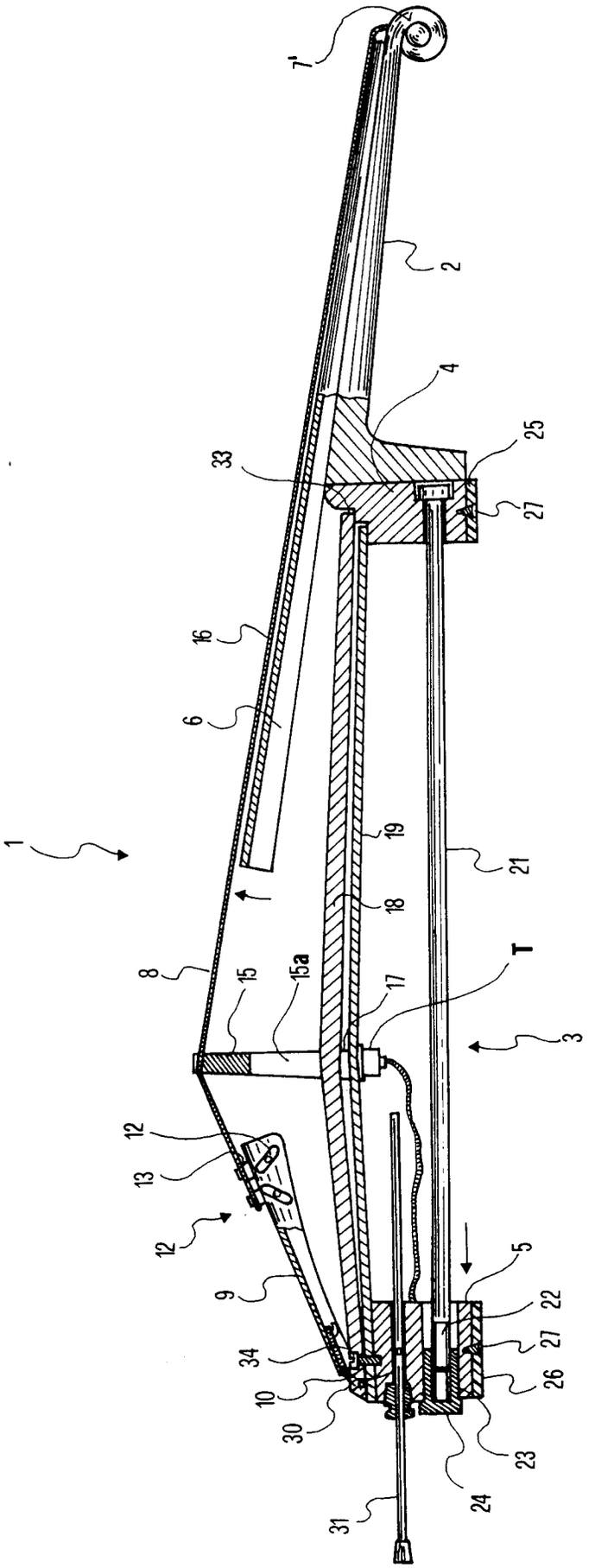
7'
2
4
25
33
27
16
6
1
19
21
18
8
15
15a
17
T
3
12
13
12
9
5
22
34
27
10
26
30
23
24
31

FIG 4

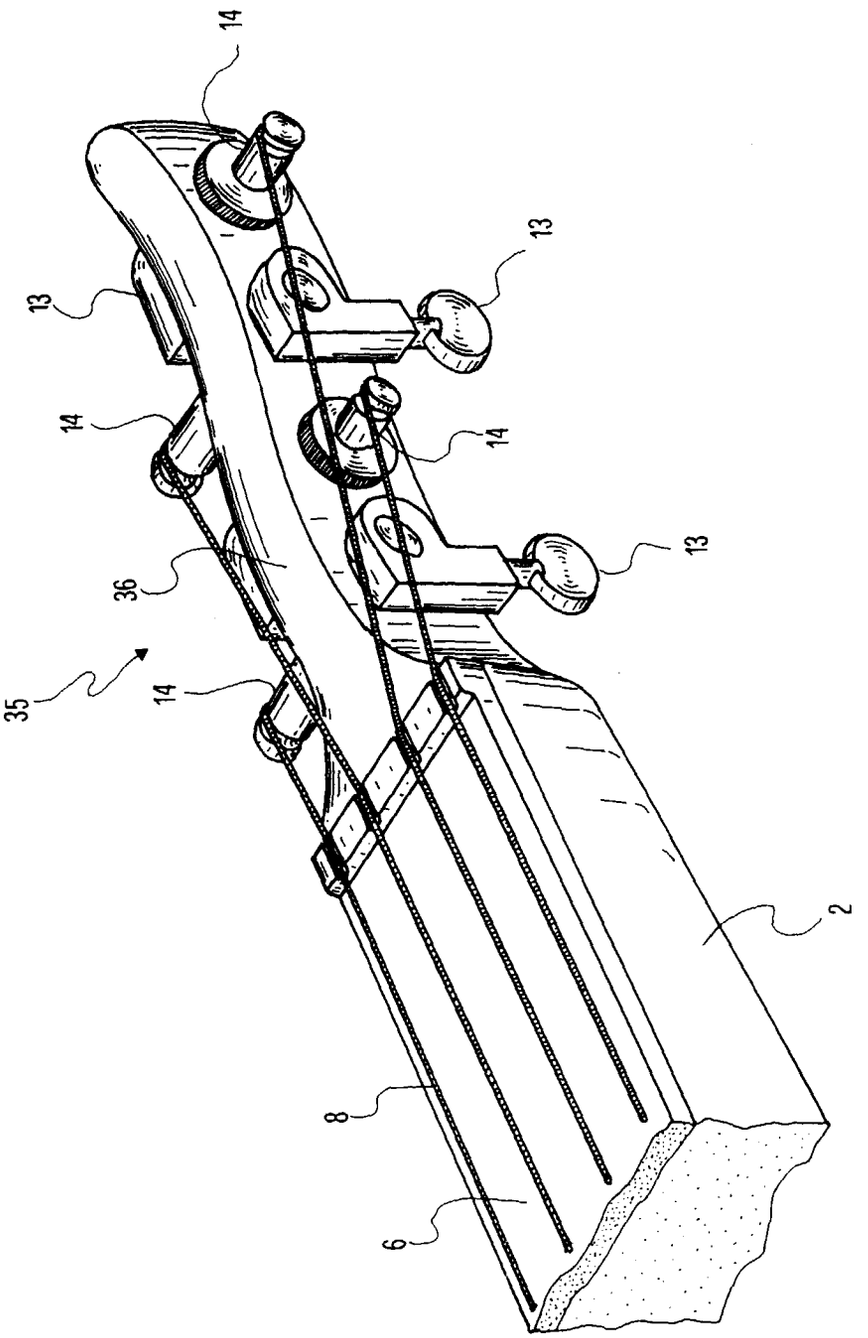

FIG 5

European Patent Office

EUROPEAN SEARCH REPORT

Application Number
EP 97 83 0544

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.6)
X	US 5 058 479 A (SHAW ERIC D) 22 October 1991 * column 4, line 13 - line 35; figure 9 *	1-3,7,15	G10D3/00
X	US 3 302 507 A (C.L. FENDER) 7 February 1967 * column 5, line 35 - line 48; figure 2 *	1-3,7,8, 15	
X	US 4 111 093 A (FIELD ROGER ET AL) 5 September 1978 * column 2, line 42 - line 54; figure 1 * * column 1, line 58 - column 60 *	1-4,7	
A	US 5 251 526 A (HILL JASON P) 12 October 1993 * column 2, line 22 - line 41 * * column 2, line 58 - line 64 *	5,6	
A	GB 1 043 201 A (ORMSTON BURNS LTD.) * figures 2,3 *	1	
			TECHNICAL FIELDS SEARCHED (Int.Cl.6)
			G10D

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	21 April 1998	Swartjes, H

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
Y : particularly relevant if combined with another document of the same category
A : technological background
O : non-written disclosure
P : intermediate document

T : theory or principle underlying the invention
E : earlier patent document, but published on, or after the filing date
D : document cited in the application
L : document cited for other reasons

& : member of the same patent family, corresponding document

EPO FORM 1503 03.82 (P04C01)

ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 97 83 0544

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on
The European Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

21-04-1998

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 5058479 A	22-10-1991	NONE	
US 3302507 A	07-02-1967	NONE	
US 4111093 A	05-09-1978	JP 1229669 C JP 52154617 A JP 59000112 B	19-09-1984 22-12-1977 05-01-1984
US 5251526 A	12-10-1993	NONE	
GB 1043201 A		NONE	

EPO FORM P0459

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