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(54) TUNING DEVICE

ABSTIMMGERÄT

SYSTÈME D'ACCORDAGE

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(56) References cited:
FR-A- 662 866
GB-A- 189 816 233
US-A- 154 022
US-A- 1 969 591
US-A- 3 319 506

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Description

TECHNICAL FIELD OF THE FINDING

[0001] The present invention relates to a tuning device for pipe musical instruments, such as an organ or a wind musical instrument.

STATE OF THE PRIOR ART

[0002] In the field of pipe musical instruments, in particular organs, it is necessary to be able to tune, in an accurate and enduring manner, both new and old musical instruments; in the latter case, during restoration, respecting the original characteristics of the instruments themselves.

[0003] The currently used tuning modes are the following.

[0004] The first tuning mode, of conventional type, is termed "cylindrical tuning" and is executed by making a cylindrical cut of the terminal part of the pipes up to the attainment of the desired height. As appears clear, this is a mode for tuning of manual type, which requires highly specialized manual ability and very long execution times. By means of this conventional technique, most of the time the desired frequency is approached, which is then improved by means of the use of "correction pegs", i.e. cones that abut against the top of the pipe in a manual but delicate manner, in order to enlarge or narrow the terminal part of the pipe itself. This type of tuning does not allow making cuts of size smaller than about 1 mm, and therefore it is hard to reach the perfect pipe frequency.

[0005] In addition, once such tuning is made, it cannot be modified: this means that the other musical instruments, that may play together with the organ in question, must be adapted to the pitch and to the temperament of the tuned organ, while the opposite is not possible.

[0006] In addition, this type of tuning of conventional type requires, during restoration, that the terminal part of the pipe be tampered with. Nevertheless the new international directives for organ restoration, and especially for the restoration of antique organs, advise against such procedure since it is deemed irreversible, as it applies modifications to the original pipes that alter the characteristics originally present in the organ; such modifications are irreversible, since once the conventional tuning has been actuated, it is not possible to use further restoration techniques that better reflect the philology of the instrument itself.

[0007] In addition, since the correction/adjustment pegs are abutted against the top of the pipe in proximity to the cut, in order to carry out the fixing thereof, it is possible that the pipe will break, especially in the case of modern pipes, due to the specific metal alloy used for the attainment thereof.

[0008] A further mode for tuning the pipe musical instruments, such as organs, is the so-called "tear tuning", which however is not very stable. According to such system, a tear is executed in the upper part of the pipe, in order to adjust the frequency thereof. Nevertheless, this is a very invasive and destructive technique, not permitted by restoration procedures of antique organs, since the cylindrical walls of the pipe are enlarged until the desired tuning is attained.

[0009] A further tuning mode, quite unscientific and rushed, consists of manually pressing the central part of the pipe, determining a tuning however with extremely poor stability. There is also the "window tuning" mode, carried out in the organs starting from the 1900s, in which an overturned U-shaped incision is made on the top of the pipe and the tongue of material - within the overturned U - is curled until the window has size suitable for tuning the pipe frequency. Also in this case, the pipe to be tuned must be made of a rigid material, capable of supporting the incision, and this is an irreversible procedure. In addition, the pipe may result unstable after such tuning has been made.

[0010] In addition, the above-described known methods do not allow varying the frequency of the pipe by much: for example, with the first method it is possible to vary the pipe to be tuned by only 2-3 hundredths of frequency. The patent No. US154022 discloses a pianoforte with an organ-pipe attachment attached thereto. In particular, it discloses a section of a metal pipe D', with its tuning tube P' and a thumb-screw o'. the thumb-screw o' is welded to the pipe D' and also to the tuning tube P'.

[0011] The present invention, as is better described hereinbelow, resolves the above-lamented drawbacks.

OBJECTS OF THE INVENTION

[0012] The technical task of the present invention is therefore to improve the state of the prior art.

[0013] In the scope of such technical task, one object of the present invention is to obtain a tuning device that allows tuning pipe musical instruments whether they are of new production or antique.

[0014] A further object of the present invention consists of obtaining a tuning device that allows an enduring and precise tuning.

[0015] A still further object of the present invention consists of obtaining a tuning device that allows varying the tuning and which is reversible.

[0016] A further object of the present invention consists of obtaining a tuning device that allows considerably reducing the times necessary for the complete tuning of a pipe musical instrument.

[0017] This task and this object are attained by the tuning device according to the enclosed claim 1 and the corresponding method claim 10.

[0018] Further advantageous characteristics are described in the dependent claims.

BRIEF DESCRIPTION OF THE DRAWINGS

[0019] The characteristics of the invention will be better understood by all men skilled in the art from the following description and from the enclosed drawing tables, given as a nonlimiting example, in which:

figure 1 is a side view of the tuning device according to the present invention;
figure 2 is a side view of a version of the tuning device according to the present invention;
figure 3 is an enlarged detail of a component of the tuning device of figure 1;
figure 4 is an enlarged detail of a further component of the tuning device of figure 1;
figure 5 is a side view of the tuning device according to the present invention applied on a conical pipe;
figure 6 is a side view of a version of the tuning device according to the present invention.

EMBODIMENTS OF THE INVENTION

[0020] With reference to the enclosed figures, reference number 1 indicates a tuning device for a pipe musical instrument, such as a pipe organ or wind musical instrument, such as a trumpet, a flute etc. According to the present invention, the tuning device allows, as will be seen more clearly below, varying the pitch and the temperament of the musical instrument that is tuned, such that the same can be adapted to the desired historical repertoire and hence play, both with musical instruments with setting that is antique with respect to current setting, and with modern instruments.

[0021] In addition, as will be appreciated in the following description, the time for tuning a register, due to the tuning device 1 according to the present invention, is reduced to 10 minutes, instead of the hour required with the conventional procedure.

[0022] In addition, due to the tuning device 1 according to the present invention, it is possible to precisely - and differently with respect to each other - tune different registers of a same musical instrument or organ, for example when the same are positioned in different places of a same building, and hence they can be subjected to different temperatures.

[0023] Finally, the tuning device according to the present invention can also be used on pipes to which a conventional type tuning has been carried out, for example pipes in which the abovementioned U-shaped window has been obtained.

[0024] The tuning device 1 according to the present invention can be applied to each pipe C or resonator, in other words the upper or terminal part of the pipe of an organ, present in a pipe musical instrument such as an organ or a wind musical instrument.

[0025] In particular, with regard to the organs, they can be tuned by acting on the upper or terminal portion of the pipes.

[0026] In particular, in one version of the invention, the tuning device 1 according to the present invention is applicable to the upper or terminal part of each pipe C of an organ, at its upper or terminal end. Such upper or terminal end is the end for the outflow of at least part of the air that determines the frequency in relation to the volume of the resonator itself.

[0027] Preferably, such tuning device is applicable to the metal cylindrical pipes, both open and shut, at the upper or terminal part of the respective pipe C or resonator, but it can be applied to musical instruments provided with pipes of any type, without departing from the protective scope of the present invention.

[0028] The tuning device, as it is visible in figure 5, can also be applied to the conical pipes, both open and shut, always at the upper or terminal part of the respective pipe C or resonator.

[0029] In one version of the invention, the pipes are open at least at the top, possibly of labial type.

[0030] In some cylindrical reed pipes, the tuning device according to the present invention can also be used for precisely reaching the note or frequency. Indeed, sometimes, by means of the conventional tuning, the attainment of such precision requires a lot of time. Hereinbelow in the present description, the terms "pipe" and "resonator" will be used indiscriminately, considering the "resonator" to be the upper or terminal part or the "body", or the length of the pipe itself.

[0031] The tuning device 1 comprises a support collar 2, fixed during use, mountable on the resonator or on the upper or terminal part of the pipe C at a certain distance from the free and/or terminal and/or upper end thereof.

[0032] The free and/or terminal and/or upper end of the pipe C or of the resonator is the end of the pipe C from which at least part of the vibrating air exits, such air generated by the musical instrument or in any case necessary for the operation thereof.

[0033] This positioning is very important since, given that the tuning device 1 is positioned at the free and/or terminal and/or upper end of the pipe C, such tuning device 1 potentially has a considerable opportunity to slide and hence tune, as will be better indicated hereinbelow.

[0034] Otherwise, for some musical instruments such as the saxophone or clarinet, a device may be provided capable of adjusting the distance between two components of the instrument itself, for example between the mouth (or mouthpiece) and mouth (or neck) of a saxophone. In such case, however, the possibility of spacing such components, and hence adjusting the tuning thereof, is limited to the extent in which such components can be separated or moved away from each other while remaining assembled for instrument operation. In addition, such device is generally associated with the portion of the instrument by means of which the air is introduced or conveyed, in other words with the portion where the sound is "born". In this manner, the applied device adjusts the intonation of all the notes of the instrument, preventing a note-by-note adjustment, as is instead possible with

the tuning device according to the present invention.

[0035] Instead, in the present invention, the tuning device 1 is positioned in the part opposite that where the air is introduced or conveyed: indeed it is positioned in the upper part of the pipe C of an organ, hence at the portion of the instrument from which at least part of the air exits or from which the sound exits, and in any case at the end of the path that the air makes within the instrument.

[0036] In addition to the abovementioned advantage, such positioning also allows the tuning device according to the present invention to be mounted/dismantled from the pipe C with great ease, without requiring the disassembly of other components which form the instrument in order to allow the positioning of the tuning instrument, and hence without requiring the reassembly of such components for instrument operation.

[0037] With regard to an organ, each pipe is substantially made of a single piece or of an inseparable portion, and hence it is not possible to position the tuning device 1 between two different portions or parts of the pipe (there is a single portion that attains the pipe itself). Therefore, in the case of the organ, the preferred portion of the tuning device 1 is at the end of the pipe, at the free and/or upper end or in any case in the end portion of the pipe C.

[0038] Finally, as will be clarified hereinbelow, the tuning device 1 according to the present invention does not determine the relative movement of two components of the pipe of the musical instrument or of the organ, but rather the relative movement of the at least two components of the tuning device, while the pipe C of the instrument remains substantially undisturbed by the tuning device 1 itself.

[0039] The support collar 2 has an annular form delimiting a region with section substantially corresponding to the transverse size of the resonator of the pipe C, in particular of the end portion thereof, and is stably fixable thereto in any suitable manner.

[0040] According to the present invention, the support collar 2 comprises a side wall 3 extending over a given section h along the longitudinal symmetry axis X of the respective pipe C.

[0041] Such side wall 3 or support collar 2 has a substantially C-shaped cross-section configuration. In addition, it comprises two ears or slots 6, placed at the respective ends of the substantially C-shaped cross section of the side wall 3 and externally rising upward from the side wall itself.

[0042] The tuning device 1 according to the present invention also comprises locking means 4, of removable or fixed type, for example clamps or welding, capable of fixing the two ears or slots 6 together, and hence anchoring the support collar 2 to the resonator of the respective pipe C in a preset position.

[0043] One detail of the support collar 2, of the ears or slots 6 and of the locking means 4 is illustrated in figure 3.

[0044] With one such configuration, the support collar 2 can be easily mounted, either fixed or removable on the respective pipe C, as will be better described hereinbelow.

[0045] The tuning device 1 according to the present invention also comprises a tubular portion 7, movable during use, provided for being slidably mounted, as will be better described hereinbelow, on the resonator of the respective pipe, at the free and/or upper and/or terminal end thereof.

[0046] More particularly, the tubular portion 7 delimits a cross section substantially corresponding to the transverse size of the resonator of the pipe C to which it is applied during use.

[0047] In particular, the tubular portion 7 does not have to be adherent to the pipe on which it is mounted, but it will suffice that it can slide thereon without generating friction, in order to be able to adjust the sliding and hence the final tuning of the instrument.

[0048] As is obvious, the tubular portion 7 has different size depending on the transverse size of the pipe C on which it must be mounted, in relation to the diameter, frequency and length of the pipe itself.

[0049] According to the invention, both the support collar 2 and the tubular portion 7 are positioned outside the pipe C.

[0050] The tubular portion 7 has a side wall 9 extending over a given section H along the longitudinal symmetry axis X of the pipe C.

[0051] According to a preferred embodiment of the invention, the extension H of the side wall 9 of the cylindrical portion 7 measures about a third or a fourth of the length of the resonator of the respective pipe C.

[0052] The internal volume of the resonator is, as is known, directly proportional to the value of the sound frequency that can be emitted by the pipe C itself.

[0053] The height h of the side wall 3 of the support collar 2 measures, for example, a quarter of the height H of the tubular portion 7. In one version of the invention, the height h can have a size comprised between 0.5 cm and 2 cm.

[0054] The tuning device 1 according to the present invention provides for means 8 for adjusting the distance between the support collar 2 and the tubular portion 7. These are provided mounted between the support collar 2 and the tubular portion 7 and during use intended to move such tubular portion 7 along the resonator of the pipe C.

[0055] In such a manner, the tubular portion 7 can project with respect to the free and/or upper and/or terminal end of the resonator by a certain sufficient amount such that the frequency that can be emitted during use by the pipe itself corresponds to a desired value.

[0056] According to the invention, the tuning device 1 comprises engagement means 8a, 8b, respectively mounted on the support collar 2 and on the tubular portion 7 and provided for engaging the adjustment means 8.

[0057] In the following description and in the enclosed drawings, two engagement means are represented, but the same can also be present in a greater number, es-

pecially those present at the tubular portion 7, as illustrated in figure 6, if the pipe C or the resonator is of larger size or if multiple tubular portions 7 are present.

[0058] An important characteristic of the engagement means, as will be better indicated hereinbelow, is that the same are calibrated and aligned, in a manner so as to allow the sliding of the adjustment means 8 at their interior and hence the adjustment of the position of the tubular portion 7 with respect to the support collar 2.

[0059] In the support collar 2, in a preferred version of the present invention, the engagement means 8a is provided on the side opposite the locking means 4, preferably in a position diametrically opposed thereto.

[0060] According to a preferred embodiment of the present invention, the engagement means 8a, 8b each have a preferably sleeve-shaped configuration.

[0061] The engagement means 8a, 8b are provided arranged, during use, aligned with each other along the pipe C, in particular along an axis parallel to the longitudinal symmetry axis X of the pipe itself, in order to receive the adjustment means 8.

[0062] The adjustment means 8 for the tuning device 1 according to the present invention comprise an adjustment bar 10. The adjustment bar 10 is engaged with the respective engagement means 8a, 8b along an axis parallel to the longitudinal axis X of the pipe. The engagement means 8b, in a version of the embodiment in which they have a sleeve-shaped configuration, as illustrated in a non-assembled form in figure 4, comprise an internal sleeve 8b1 and an external sleeve 8b2.

[0063] In one version of the invention, the adjustment bar 10 comprises a portion 10a with substantially circular and threaded cross section, passing through the sleeve-shaped engagement means 8b, or through the internal sleeve 8b1, provided on the tubular portion 7.

[0064] The internal sleeve 8b1 or generally the sleeve-shaped engagement means 8b, as will be described hereinbelow, has an internal thread with pitch corresponding to the thread pitch of the adjustment means 8, in particular of the threaded portion 10a of the bar 10. The external sleeve 8b2 is instead internally smooth and adapted to be coupled with the internal sleeve 8b1.

[0065] The engagement means 8a, in a version of the embodiment in which they have a sleeve-shaped configuration, as illustrated in figure 3, comprise an external sleeve 8a2. The cylindrical opening of the external sleeve 8a2 is not threaded, but rather is smooth.

[0066] The adjustment bar 10 also has an end portion 10b, preferably with cylindrical form, rotatably mounted in the engagement means 8a or in the external sleeve 8a2 provided on the support collar 2.

[0067] At the opposite ends of the end portion 10b, fixed locking portions can be provided, in a manner so as to prevent the end portion 10b from sliding along the adjustment bar 10. The adjustment bar 10 also comprise a grip portion 11, e.g. obtained by means of a sleeve 11a fixed in any suitable manner to the bar itself.

[0068] In one version of the invention, the bar 10 is a worm screw.

[0069] In one version of the invention, the bar 10 has, during use, the grip portion 11 at the top of the pipe C or tubular portion 7, such that it is easy for an operator to grip the bar above of the pipes C of the instrument.

[0070] With one such configuration, it is clear that it is possible to manually operate on the bar 10, possibly by means of use of a suitable tool, for example a screwdriver or a suitable coupling bar, in a manner such that the heat of the hand does not affect the metal forming the pipe and hence the tuning does not result altered.

[0071] The actuation of the bar 10 occurs by rotating it around its longitudinal axis and thus obtaining a translation of the tubular portion 7 to or from the free end of the resonator, depending on the rotation direction imparted to the bar.

[0072] In an alternative version of the invention, the bar 10 has, during use, the grip portion 11 at the end of the pipe C opposite its top, or at the support collar 2.

[0073] In such case, for example for long pipes, the tuning procedure can occur from the bottom, without risks for the operator.

[0074] In such a manner, in fact, it is easy for an operator to grip the bar below the pipes C of the instrument, by rotating the bar 10 from the bottom, e.g. remaining on the ground and being able to tune pipes C even of considerable height.

[0075] The external sleeves 8a2 and 8b2 have, at the cylindrical side wall thereof, a flat or flattered portion 8a3 and 8b3.

[0076] The function of the flat portion 8a3 and 8b3 will be explained in detail in the course of the present description.

[0077] In a preferred embodiment, the flat portion 8a3 and 8b3 is positioned on the opposite side with respect to the zone of the cylindrical side portion of the respective sleeves which will be fixed, e.g. by means of welding, respectively to the support collar 2 and to the tubular portion 7.

[0078] The external sleeves 8a2 and 8b2 and the flat portions 8a3 and 8b3 have a threaded through opening which is in communication with the hollow internal portion of the respective sleeves.

[0079] Such threaded through opening is substantially orthogonal to the longitudinal axis X of the pipe C.

[0080] The tuning device according to the present invention can also comprise means 12 for locking the bar 10 in position, in a manner such that, once the position of the tubular portion 7 has been adjusted with respect to the support collar 2, such position cannot be changed over time, e.g. due to the vibrations of the pipe C when in use.

[0081] Such position locking means 12 comprise means for tightening the bar at the respective engagement means 8a, 8b, e.g. a pair of screws 12a, 12b each provided for being screwed in the corresponding threaded opening, if necessary obtained in the respective engagement means, i.e. in the corresponding opening

present in the external sleeves 8a2 and 8b2 and in the flat portions 8a3 and 8b3.

[0082] In one version of the invention, such screws 12a, 12b are positioned in a manner such to respectively abut against the portion 10b of the bar itself and/or against the internal sleeve 8b1, preventing the further rotation of the bar 10.

[0083] Due to the position locking means 12, the engagement means 8a and 8b act as if they were made of a single piece, i.e. that the external sleeve 8b2 is integral with the internal sleeve 8b1, with the flattened portion 8b3 and with the tubular portion 7.

[0084] Analogously, the external sleeve 8a2 is integral with the flat portion 8a3 and with the support collar 2.

[0085] In one version of the invention, the external sleeve 8b2 is obtained in a single piece with the flattened portion 8b3 and/or the external sleeve 8a2 is obtained in a single piece with the flat portion 8a3.

[0086] The diameter of the bar 10 and the width of the thread can depend on the size of the pipe C to be tuned. Therefore, such size can be varied according to the specific needs of the tuner.

[0087] When the support collar 2 and the tubular portion 7 are applied on the resonator of the pipe C, they can be found at a certain distance from each other or in abutment against each other. In the latter case, the edge 2a of the support collar 2, directed towards the tubular portion 7, and the edge 7a of the tubular portion 7, directed towards the support collar 2, are in contact with each other. With the adjustment by the adjustment means 8, the edge 7b of the tubular portion 7 may be projecting with respect to the free and/or upper and/or terminal end of the resonator, and acts as top edge of the resonator or of the pipe C itself.

[0088] Therefore, considering the positioning with respect to the free and/or upper and/or terminal end of the pipe C, the tubular portion 7 is positioned at the same end while the support collar 2 is positioned moved away from such end by a given section. Such section corresponds at least to the height H of the tubular portion 7.

[0089] In one version of the invention, the edge 7b of the tubular portion 7 - in an initial tuning step and after having fixed the support collar 2 and the tubular portion 7 on the pipe C - is placed precisely at the free and/or upper and/or terminal end of the pipe itself. With the tuning, then, such edge will project with respect to such end, as indicated above. The tubular portion 7, slidable with respect to the support collar 2, can be spaced from the collar also by 2, 3 cm depending on the specific needs, such that its edge 7b can during use be situated beyond the free and/or upper and/or terminal end of the resonator, actually elongating the resonator by the amount necessary and sufficient for emitting a sound at a desired frequency.

[0090] In such a manner, the tuning of the pipe occurs through the tuning device 1 according to the present invention.

[0091] In addition, in such a manner, by calculating the size of the movement or elongation of the edge 7b of the tubular portion 7 with respect to the free end of the pipe C, it is possible to know the exact length variation (and hence emitted sound variation) of the antique pipe with respect to the original, therefore also acting as a research means for conducting a study of antique organs, in particular of their pipes and of the variation that the same have sustained over time.

[0092] In a further version of the invention, the support collar 2 and/or the tubular portion 7 can have, at the inner surface thereof in contact with the pipe C or resonator, a layer of felt or leather or suede or other low friction material, possibly soft, capable of preventing the surface damaging or rubbing of the pipe following the application of the support collar 2 and/or sliding of the tubular portion 7 thereon, without simultaneously preventing the sliding of the tubular portion 7.

[0093] According to a method for tuning a pipe musical instrument, such as an organ or a musical wind instrument, the present invention provides for applying a support collar 2 on the resonator or on each pipe C at a preset distance from the free end of the resonator itself.

[0094] More particularly, this step involves tightening the support collar 2, e.g. by fixing the locking means 4 around the two ears or slots 6 present in the same, in a manner such that the collar is stably anchored in the pipe itself.

[0095] It is then provided to apply the tubular portion 7 at the free and/or upper and/or terminal end of the resonator of the pipe C and to engage the support collar 2 and the tubular portion 7 together by means of the means 8 for adjusting the mutual distance between the tubular portion 7 and the support collar 2, possibly - depending on the configuration - by means of the use of engagement means 8a, 8b.

[0096] It is then provided to adjust the mutual distance between the tubular portion 7 and the support collar 2 as a function of the desired frequency to be emitted by the pipe C in question during use.

[0097] The distance adjustment step, as already mentioned above, consists of longitudinally sliding the tubular portion 7 with respect to the support collar 2, and consequently, of varying the overall height of the resonator of the pipe C, thus adjusting the frequency thereof.

[0098] According to the present invention, therefore, one operates on the overall height of the entire pipe, without having to make slits or windows in the pipe itself, preserving the complete integrity thereof.

[0099] The longitudinal sliding or translation of the tubular portion 7 with respect to the support collar 2 occurs by means of the actuation of the adjustment bar 10, for example by means of screwing the threaded bar in one sense or in the other depending on the case.

[0100] In this manner, the tuning occurs, from the top or bottom, without having to touch the pipe C. In such a manner, therefore, there is no risk that the heat of the operator's hand can make the metal of the pipe expand, thus altering the correct measurement of the desired fre-

quency.

[0101] In one version of the invention, the support collar 2 and/or the tubular portion 7 are made of brass.

[0102] In an alternative version, the support collar 2 and/or the tubular portion 7 can be made of plastic material; in such version, the plastic material has good wear resistance, good "anti-adherence" and/or good chemical inertia.

[0103] For example, the support collar 2 and/or the tubular portion 7 can be made of polytetrafluoroethylene (or PTFE), i.e. a tetrafluoroethene polymer, normally known through its commercial names such as Teflon, Fluon, Algoflon or Hostaflon, in which other stabilizing and fluidifying components are added to the polymer in order to improve the application possibilities thereof.

[0104] PTFE is a material having a very low friction coefficient, and therefore it allows a facilitated sliding of the support collar 2, during its positioning, and/or of the tubular portion 7, during the tuning.

[0105] In a still further version of the invention, the support collar 2 and/or the tubular portion 7 can be made of synthetic polyamide or nylon, the latter being the name of a particular family of synthetic polyamides, i.e. aliphatic polyamides.

[0106] Such materials, given that they are resistant to high temperatures, are not affected by the temperature variations to which such musical instruments or the various components thereof are subjected.

[0107] In addition, such materials, especially Teflon or polytetrafluoroethylene, being chemically inert, are resistant to salt or other substances with which they can come into contact.

[0108] It is clear that also the further components of the tuning device according to the present invention, including the adjustment bar 10 and the grip portion 11, can be made of such plastic materials.

[0109] In addition, even the various sleeve-shaped or nut-shaped components present in the device according to the present invention can be made of such plastic materials, and in particular of Teflon, since the possible thread obtained therein is maintained over time due to such materials.

[0110] Finally, such materials, having a kind of "self-lubrication", slide and are screwed on each other without difficulty and seizure, which could comprise the functionality thereof.

[0111] An expedient for the good operation of the tuning device 1 is that, as stated above, the adjustment means 8 and the engagement means 8a, 8b are mounted perfectly aligned with each other along an axis parallel to the longitudinal axis X of the pipe C.

[0112] For such purpose, the tuning device according to the present invention comprises auxiliary alignment means (illustrated in figure 2) between the above-described sleeves 8a and 8b, in a manner such that the bar 10 passing therein can easily turn in the same and consequently easy sliding/translation of the tubular portion 7 can be allowed with respect to the support collar 2 and the resonator.

[0113] Such auxiliary means comprise a device for aligning the resonator or the pipe C, adapted to receive the pipe C provided with a support collar 2 and with a tubular portion 7, or in particular the upper or terminal part of the pipe C provided with such components. Such alignment device allows aligning the longitudinal axis of the pipe C along a predetermined direction.

[0114] The alignment of the pipe can occur by centering the same with respect to the aforesaid auxiliary means.

[0115] Such predetermined direction corresponds to the longitudinal extension of an alignment bar 100, having a longitudinal symmetry axis, as described hereinbelow.

[0116] The alignment bar 100 is adapted to allow the alignment of the engagement means 8a and 8b along an axis parallel to the longitudinal axis of the pipe C. In such a manner, the engagement means 8a and 8b, as indicated above, will be aligned with each other and with the longitudinal axis of symmetry of the pipe C and of the alignment bar 100. This alignment allows the adjustment means 8 to easily slide within the engagement means 8a and 8b and, at the same time, to translate the tubular portion 7 of the tuning device 1 along the resonator to be tuned or along its longitudinal axis X.

[0117] The alignment bar 100 has a square section or at least one flat face and through holes 101, perpendicular to the longitudinal symmetry axis of the alignment bar 100 and to the at least one flat face thereof, for the alignment of the engagement means 8a and 8b. The through holes 101 are aligned along the longitudinal symmetry axis of the alignment bar 100.

[0118] The alignment bar 100 is fixed to means for adjusting its height and its angular tilt with respect to the longitudinal symmetry axis X of the pipe C.

[0119] In one embodiment, such adjustment means comprise a hinge support 102, to which the alignment bar 100 is fixed, which allows varying the angle between the pipe C and the alignment bar 100, in order to arrange the latter, with regard to its longitudinal extension, in a manner parallel to the longitudinal axis of the pipe itself.

[0120] The hinge support 102 is in turn fixed to a support plate 103, height-adjustable, in order to vary the height of the alignment bar 100 with respect to the pipe C.

[0121] Also fixed to the alignment bar 100, through suitable screws 105, are fixing means or bolts 104 insertable in the through holes 101 present in the bar itself.

[0122] In particular, the screws 105 have a length such to allow the fixing of the fixing means or bolts 104, of the alignment bar 100 and of the engagement means 8a and 8b. In particular, the screws 105 are screwable in the openings present in the latter, ensuring that the flat portion 8a3 and 8b3 comes into contact with one face of the alignment bar 100, which as said has a square section or at least one flat face. In such a manner, the engagement means 8a and 8b are aligned along the longitudinal symmetry axis of the alignment bar 100 which, as stated,

is parallel to the axis of symmetry of the pipe C. Therefore, the engagement means 8a and 8b can be respectively welded to the support collar 2 and to the tubular portion 7, with the certainty that the same have the correct alignment along the pipe C in order to allow the sliding of the adjustment means 8 at their interior and hence the movement of the tubular portion 7 with respect to the support collar 2, in order to determine the tuning of the pipe C.

[0123] In one version of the invention, the engagement means 8a and 8b can of the type or of material suitable for the same to be able to respectively lock the internal sleeve 8b1 and the external sleeve 8b2, or in a further version the end portion 10b and the external sleeve 8a2, respectively turning or rotating the internal sleeve 8b1 on the external sleeve 8b2 or the external sleeve 8a2 on the end portion 10b. In one version of the invention, the internal sleeve 8b1 and/or the end portion 10b can each be made of two components, which can be of the type or of material suitable for the same to be able to be respectively locked on the adjustment bar 10, respectively tuning or rotating the two components of each element, such as a nut and lock nut.

[0124] The tuning device according to the present invention respects the new international standards with regard to restoration since it is reversible, in the sense that, especially for the most antique instruments that are subjected to protection, the tuning device can be easily removed without at all damaging or altering the pipe on which it was fixed.

[0125] In modern instruments, however, the support collar of the tuning device according to the present invention can if desired be stably fixed, for example welded, to the respective pipe.

[0126] In addition, with a tuning device according to the present invention, it is possible to vary the emission frequency of each pipe with deviation on the order of tenths of frequency or tenths of hertz, i.e. during tuning it is possible to modify the sound that can be emitted with a given pipe, even by a tone.

[0127] In addition, the tuning thus remains stable over time, without destructive operations on the pipes themselves.

[0128] Thus, the invention attains the proposed objects.

[0129] The present invention was described according to preferred embodiments, but equivalent variants can be conceived without departing from the protective scope offered by the following claims. In addition, the characteristics described for one version or embodiment can also be present in other variants or embodiments, without departing from the protective scope offered by the following claims.

[0130] Hence, for example, the means for adjusting the distance between the movable tubular portion 7 and the fixed support collar 2 can be obtained by equivalent means, so long as they precisely achieve the longitudinal movement of the tubular portion 7 with respect to the support collar 2 and hence with respect to the free and/or upper and/or terminal end of the resonator of the respective pipe C. In place of the adjustment bar 10, which can be threaded, for example, a cylindrical non-threaded bar could be provided and the movement of the tubular portion 7 with respect to the fixed support collar 2 could occur by means of a manual translation by an operator.

[0131] Additionally, in place of the adjustment bar 10, which can be threaded, a longitudinal rack could be provided for connecting between the support collar 2 and the tubular portion 7 and the latter could be fixed in a known manner to a toothed wheel provided slidable on the rack and hence with respect to the support collar 2.

[0132] In addition the movement or adjustment might not be manual but mechanical, electrical, electronic or mechanized, e.g. by means of actuation means.

[0133] The actuation means can for example comprise a drive motor or a gear motor group.

[0134] In such case, the drive motor or gear motor group can be positioned at the grip portion 11 or at one end of the adjustment bar 10 or at the end portion 10b of the adjustment bar 10, or they can be connected thereto.

[0135] The actuation means can further comprise means for transmitting motion, interposed between the drive motor or gear motor and the grip portion 11 or the end of the adjustment bar 10. In one version of the invention, the motion transmission means comprise at least one flexible element, capable of transmitting the motion generated by the drive motor or gear motor and connecting the adjustment rod 8, without gears. Such motion transmission means, being flexible, allow the actuation of the adjustment bar 10 in a facilitated manner, without requiring the flexible element to be perfectly aligned with the adjustment bar itself.

[0136] Such expedients can be particularly useful if long (e.g. from 4 m to 8 m) or heavy pipes are present.

Claims

1. Tuning device for pipe musical instruments comprising:

   - one fixed, in use, support collar (2), which has an annular form and is applicable to a pipe (C) at a preset distance from an upper end thereof, said pipe extending along a respective longitudinal symmetry axis, wherein said support collar (2) comprises one side wall (3) extending over a section (h) along said longitudinal symmetry axis of said pipe (C),
   - one movable, in use, tubular portion (7), slidably applicable on said pipe (C) at the upper end of the same, wherein said tubular portion (7) has a side wall (9) extending over a certain section (H) along said longitudinal symmetry axis of said pipe (C),
   - adjustment means (8) between said tubular

portion (7) and said support collar (2), provided for adjusting a distance between said movable, in use, tubular portion (7), and said fixed, in use, support collar (2), so that said tubular portion (7) is configured to project with respect to said upper end,

- engagement means (8a, 8b), respectively mounted on said support collar (2) and on said tubular portion (7) and provided for engaging said adjustment means (8), **characterized in that** said support collar (2) delimits a region having a cross-section substantially corresponding to a transversal overall dimension of said pipe (C) and **in that** both said support collar (2) and said tubular portion (7) are configured to be positioned outside the pipe (C).

2. Device according to claim 1, wherein said tubular portion (7) delimits a cross-section substantially corresponding to the transversal overall dimension of said pipe (C) and/or wherein said support collar (2) is mounted in a removable way on said pipe (C).

3. Device according to claim 1 or 2, wherein said side wall (3) has a substantially C-shaped cross-section configuration, optionally with two ears or slots (6), arranged at the respective ends of said side wall (3) and externally extending from said side wall (3) and/or wherein said tuning device comprises means (4) for locking said support collar (2) to said pipe (C).

4. Device according to any previous claim, wherein said support collar (2) and/or said tubular portion (7) have, at the inner surface thereof in contact with the pipe (C), a felt or leather or suede layer or any other low friction material, for preventing the surface damaging or rubbing of the pipe (C).

5. Device according to claim 1, wherein said engagement means (8a, 8b) are provided arranged, in use, aligned with respect to each other along an axis parallel to the longitudinal symmetry axis of said pipe (C) and wherein said adjustment means (8) comprise an adjustment bar (10), wherein said adjustment bar (10) is engaged with said engagement means (8a, 8b) along an axis parallel to said longitudinal symmetry axis of said pipe (C).

6. Device according to claim 5, wherein said engagement means (8a) comprise an external sleeve (8a2) and/or wherein said engagement means (8b) comprise an internally threaded internal sleeve (8b1) and an external sleeve (8b2), designed to be internally coupled with said internal sleeve (8b1).

7. Device according to any claim 6, wherein said adjustment bar (10) comprises a threaded portion (10a) passing through said engagement means (8b) or through the internal sleeve (8b1) thereof, wherein said engagement means (8b) is provided fixed to said tubular portion (7), and/or wherein said engagement means (8b) or said internal sleeve thereof (8b1) has an internal pitch thread corresponding to the thread pitch of said portion (10a) of said bar (10) and/or wherein said adjustment bar (10) has an end portion (10b) rotatably mounted in the engagement means (8a) or in the external sleeve (8a2) thereof, wherein said engagement means (8a) is provided fixed to said support collar (2).

8. Device according to claim 6 or claim 7, wherein said external sleeves (8a2, 8b2) of said engagement means (8a, 8b) have, at a cylindrical side wall thereof, a flat portion (8a3, 8b3).

9. Device according to claims 6 to 8, comprising means (12) for locking said bar (10) in position, so that, upon adjusting the position of said tubular portion (7) with respect to said support collar (2), said position does not change over time and wherein said position locking means (12) comprise at least one pair of screws (12a, 12b), each being screwable in a corresponding threaded opening obtained for this purpose in a respective engagement means of said engagement means (8a, 8b) or in the flat portions (8a3, 8b3) thereof, so that each screw (12a, 12b) of said pair ends up in abutment against said end portion (10b) of said bar (10) or on said internal sleeve (8b1) of said engagement means (8b).

10. Method for tuning a pipe musical instrument, comprising the following steps:

- providing a tuning device according to any claim 1 to 9 for each pipe to be tuned,
- applying one support collar (2) on each pipe (C) at a preset distance from an upper end thereof, wherein said support collar (2) has an annular form and delimits a region having a cross-section substantially corresponding to a transversal overall dimension of said pipe (C),
- applying one tubular portion (7) at said upper end of said pipe (C), wherein both said support collar (2) and said tubular portion (7) are positioned outside the pipe (C),
- engaging said support collar (2) and said tubular portion (7) with each other using means (8) configured for adjusting a distance between said tubular portion (7) and said support collar (2), and
- adjusting said distance between said tubular portion (7) and said support collar (2) so that said tubular portion (7) projects with respect to said upper end as a function of the desired frequency released, in use, by said pipe (C).

11. Method according to claim 10 , wherein said step of applying said support collar (2) on said each pipe (C) comprises a step of tightening said support collar (2), by fixing said locking means (4) around two ears or slots (6), so that they are suitably anchored to said pipe.

12. Method according to claim 10 or 11, wherein said step of adjusting said distance comprises longitudinally sliding said tubular portion (7) with respect to said support collar (2) by varying the overall height of said pipe (C) and/or wherein said step of longitudinally sliding said tubular portion (7) with respect to said support collar (2) comprises screwing an adjustment bar (10) of said adjustment means (8).

Patentansprüche

1. Stimmvorrichtung für Pfeifen-Musikinstrumente, umfassend:

- ein bei Verwendung fester Stützkragen (2), der eine ringförmige Form aufweist und an einer Pfeife (C) mit einem voreingestellten Abstand von einem oberen Ende derselben anbringbar ist, wobei sich die besagte Pfeife entlang einer jeweiligen Längssymmetrieachse erstreckt, worin der besagte Stützkragen (2) eine Seitenwand (3), die sich über einen Abschnitt (h) entlang der besagten Längssymmetrieachse der besagten Pfeife (C) erstreckt, umfasst,
- einen bei Verwendung beweglichen röhrenförmigen Abschnitt (7), der gleitend auf der besagten Pfeife (C) am oberen Ende derselben anbringbar ist, worin der besagte röhrenförmige Abschnitt (7) eine Seitenwand (9) aufweist, die sich über einen bestimmten Abschnitt (H) entlang der besagten Längssymmetrieachse der besagten Pfeife (C) erstreckt,
- Einstellmittel (8) zwischen dem besagten röhrenförmigen Abschnitt (7) und dem besagten Stützkragen (2), die zum Einstellen eines Abstands zwischen dem besagten bei Verwendung beweglichen röhrenförmigen Abschnitt (7) und dem besagten bei Verwendung festen Stützkragen (2) vorgesehen sind, sodass der besagte röhrenförmige Abschnitt (7) konfiguriert ist, um in Bezug auf das besagte obere Ende vorzustehen,
- Eingriffsmittel (8a, 8b), die jeweils auf dem besagten Stützkragen (2) und auf dem besagten röhrenförmigen Abschnitt (7) angebracht und zum Eingriff mit den besagten Einstellmitteln (8) vorgesehen sind, **dadurch gekennzeichnet, dass** der besagte Stützkragen (2) einen Bereich mit einem Querschnitt begrenzt, der im Wesentlichen einer transversalen Gesamtabmessung der besagten Pfeife (C) entspricht, und dadurch, dass sowohl der besagte Stützkragen (2) als auch der besagte röhrenförmige Abschnitt (7) konfiguriert sind, um außerhalb der Pfeife (C) positioniert zu werden.

2. Vorrichtung nach Anspruch 1, worin der besagte röhrenförmige Abschnitt (7) einen Querschnitt begrenzt, der im Wesentlichen der transversalen Gesamtabmessung der besagten Pfeife (C) entspricht, und/oder worin der besagte Stützkragen (2) auf lösbare Weise an der besagten Pfeife (C) angebracht ist.

3. Vorrichtung nach Anspruch 1 oder 2, worin die besagte Seitenwand (3) eine im Wesentlichen C-förmige Querschnittskonfiguration, optional mit zwei Ohren oder Schlitzen (6), die an den jeweiligen Enden der besagten Seitenwand (3) angeordnet sind und sich von der besagten Seitenwand (3) nach außen erstrecken, aufweist und/oder worin die besagte Stimmvorrichtung Mittel (4) zum Verriegeln des besagten Stützkragens (2) an der besagten Pfeife (C) umfasst.

4. Vorrichtung nach irgendeinem vorangegangenen Anspruch, worin der besagte Stützkragen (2) und/oder der besagte röhrenförmige Abschnitt (7) an seiner inneren mit der Pfeife (C) in Berührung kommenden Oberfläche eine Filz- oder Leder- oder Wildlederschicht oder ein anderes Material mit geringer Reibung aufweist, um das Beschädigen oder Reiben der Oberfläche der Pfeife (C) zu verhindern.

5. Vorrichtung nach Anspruch 1, worin die besagten Eingriffsmittel (8a, 8b) so vorgesehen sind, dass sie bei Verwendung in Bezug zueinander entlang einer Achse parallel zur Längssymmetrieachse der besagten Pfeife (C) ausgerichtet sind, und worin die besagten Einstellmittel (8) eine Einstellstange (10) umfassen, worin die besagte Einstellstange (10) mit den besagten Eingriffsmitteln (8a, 8b) entlang einer Achse parallel zur besagten Längssymmetrieachse der besagten Pfeife (C) in Eingriff steht.

6. Vorrichtung nach Anspruch 5, worin die besagten Eingriffsmittel (8a) eine Außenhülse (8a2) umfassen und/oder worin die besagten Eingriffsmittel (8b) eine mit einem Innengewinde versehene Innenhülse (8b1) und eine Außenhülse (8b2), die dazu ausgelegt ist, innen mit der Innenhülse (8b1) verbunden zu werden, umfassen.

7. Vorrichtung nach irgendeinem Anspruch 6, worin die besagte Einstellstange (10) einen Gewindeabschnitt (10a) aufweist, der durch das besagte Eingriffsmittel (8b) oder durch die Innenhülse (8b1) desselben führt, worin das besagte Eingriffsmittel (8b) an dem

besagten röhrenförmigen Abschnitt (7) befestigt vorgesehen ist, und/oder worin das besagte Eingriffsmittel (8b) oder die besagte Innenhülse (8b1) desselben ein inneres Steigungsgewinde aufweist, das der Gewindesteigung des besagten Abschnitts (10a) der besagten Stange (10) entspricht, und/oder worin die besagte Einstellstange (10) einen Endabschnitt (10b) aufweist, der drehbar in dem Eingriffsmittel (8a) oder in dessen Außenhülse (8a2), worin das besagte Eingriffsmittel (8a) an dem besagten Stützkragen (2) befestigt vorgesehen ist, angebracht ist.

8. Vorrichtung nach Anspruch 6 oder Anspruch 7, worin die besagten Außenhülsen (8a2, 8b2) der besagten Eingriffsmittel (8a, 8b) an einer zylindrischen Seitenwand derselben einen flachen Abschnitt (8a3, 8b3) aufweisen.

9. Vorrichtung nach einem der Ansprüche 6 bis 8, umfassend Mittel (12) zum Verriegeln der besagten Stange (10) in ihrer Position, sodass beim Einstellen der Position des besagten röhrenförmigen Abschnitts (7) in Bezug auf den besagten Stützkragen (2) die besagte Position sich im Laufe der Zeit nicht ändert, und worin die besagten Positionsverriegelungsmittel (12) mindestens ein Paar Schrauben (12a, 12b) umfassen, wobei jedes in eine entsprechende Gewindeöffnung, die zu diesem Zweck in einem jeweiligen Eingriffsmittel der besagten Eingriffsmittel (8a, 8b) oder in den flachen Abschnitten (8a3, 8b3) davon erhalten sind, einschraubbar ist, sodass jede Schraube (12a, 12b) des besagten Paares in Anlage an den besagten Endabschnitt (10b) der besagten Stange (10) oder an der besagten Innenhülse (8bl) des besagten Eingriffsmittels (8b) endet.

10. Verfahren zum Stimmen eines Pfeifen-Musikinstruments, umfassend die folgenden Schritte:

- Bereitstellen einer Stimmvorrichtung nach irgendeinem Anspruch 1 bis 9 für jede zu stimmende Pfeife,
- Anbringen eines Stützkragens (2) an jeder Pfeife (C) in einem voreingestellten Abstand von einem oberen Ende derselben, worin der besagte Stützkragen (2) eine ringförmige Form aufweist und einen Bereich mit einem Querschnitt begrenzt, der im Wesentlichen einer transversalen Gesamtabmessung der besagten Pfeife (C) entspricht,
- Anbringen eines röhrenförmigen Abschnitts (7) an dem besagten oberen Ende der besagten Pfeife (C), worin sowohl der besagte Stützkragen (2) als auch der besagte röhrenförmige Abschnitt (7) außerhalb der besagten Pfeife (C) positioniert sind,
- Eingreifen des besagten Stützkragens (2) und des besagten röhrenförmigen Abschnitts (7) ineinander unter Verwendung von Mitteln (8), die zum Einstellen eines Abstands zwischen dem röhrenförmigen Abschnitt (7) und dem besagten Stützkragen (2) konfiguriert sind, und
- Einstellen des besagten Abstands zwischen dem besagten röhrenförmigen Abschnitt (7) und dem besagten Stützkragen (2), sodass der besagte röhrenförmige Abschnitt (7) in Bezug auf das besagte obere Ende in Abhängigkeit von der gewünschten Frequenz, die bei Verwendung von der Pfeife (C) abgegeben wird, vorsteht.

11. Verfahren nach Anspruch 10, worin der besagte Schritt des Anbringens des besagten Stützkragens (2) an jeder besagten Pfeife (C) einen Schritt des Festziehens des besagten Stützkragens (2) durch Befestigen der besagten Verriegelungsmittel (4) um zwei Ohren oder Schlitze (6) herum umfasst, sodass sie zweckmäßig an der besagten Pfeife verankert sind.

12. Verfahren nach Anspruch 10 oder 11, worin der besagte Schritt des Einstellens des besagten Abstands das Längsverschieben des besagten röhrenförmigen Abschnitts (7) in Bezug auf den besagten Stützkragen (2) durch Variieren der Gesamthöhe der besagten Pfeife (C) umfasst und/oder worin der besagte Schritt des Längsverschiebens des besagten röhrenförmigen Abschnitts (7) in Bezug auf den besagten Stützkragen (2) das Schrauben einer Einstellstange (10) der besagten Einstellmittel (8) umfasst.

Revendications

1. Dispositif d'accordage pour instrument de musique à tuyau comprenant :

- un collier de support (2) fixe, pendant l'utilisation, de forme annulaire et applicable à un tuyau (C) à une distance prédéterminée d'une extrémité supérieure de celui-ci, ledit tuyau s'étendant le long d'un axe de symétrie longitudinal respectif, dans lequel ledit collier de support (2) comprend une paroi latérale (3) s'étendant sur une section (h) le long dudit axe de symétrie longitudinal dudit tuyau (C),
- une partie tubulaire (7) mobile, pendant l'utilisation, applicable de manière coulissante sur ledit tuyau (C) à l'extrémité supérieure de celui-ci, dans lequel ladite partie tubulaire (7) comporte une paroi latérale (9) s'étendant sur une certaine section (H) le long dudit axe de symétrie longitudinal dudit tuyau (C),
- des moyens d'ajustement (8) entre ladite partie tubulaire (7) et ledit collier de support (2), prévus

pour ajuster une distance entre ladite partie tubulaire (7) mobile, pendant l'utilisation, et ledit collier de support (2) fixe, pendant l'utilisation, de telle sorte que ladite partie tubulaire (7) soit configurée pour être saillante par rapport à ladite extrémité supérieure,

- des moyens d'accouplement (8a, 8b), montés respectivement sur ledit collier de support (2) et sur ladite partie tubulaire (7) et prévus pour s'accoupler avec lesdits moyens d'ajustement (8), **caractérisés en ce que** ledit collier de support (2) délimite une région ayant une section transversale correspondant sensiblement à une dimension globale transversale dudit tuyau (C) et **en ce que** ledit collier de support (2) et ladite partie tubulaire (7) sont configurés pour être positionnés à l'extérieur du tuyau (C).

2. Dispositif selon la revendication 1, dans lequel ladite partie tubulaire (7) délimite une section transversale correspondant sensiblement à la dimension globale transversale dudit tuyau (C) et/ou dans lequel ledit collier de support (2) est monté de manière amovible sur ledit tuyau (C).

3. Dispositif selon la revendication 1 ou 2, dans lequel ladite paroi latérale (3) a une configuration de section transversale sensiblement en C, éventuellement avec deux oreilles ou fentes (6), disposées aux extrémités respectives de ladite paroi latérale (3) et s'étendant extérieurement depuis ladite paroi latérale (3) et/ou dans lequel ledit dispositif d'accordage comprend des moyens (4) pour verrouiller ledit collier de support (2) audit tuyau (C).

4. Dispositif selon quelconque revendication précédente, dans lequel ledit collier de support (2) et/ou ladite partie tubulaire (7) ont, à leur surface intérieure en contact avec le tuyau (C), une couche en feutre ou cuir ou daim ou tout autre matière à faible frottement, pour empêcher la surface d'endommager ou de frotter le tuyau (C) .

5. Dispositif selon la revendication 1, dans lequel lesdits moyens d'accouplement (8a, 8b) sont disposés, pendant l'utilisation, en alignement l'un par rapport à l'autre le long d'un axe parallèle à l'axe de symétrie longitudinal dudit tuyau (C) et dans lequel lesdits moyens d'ajustement (8) comprennent une barre d'ajustement (10), dans lequel ladite barre d'ajustement (10) est accouplée avec lesdits moyens d'accouplement (8a, 8b) le long d'un axe parallèle audit axe de symétrie longitudinal dudit tuyau (C).

6. Dispositif selon la revendication 5, dans lequel lesdits moyens d'accouplement (8a) comprennent un manchon extérieur (8a2) et/ou dans lequel lesdits moyens d'accouplement (8b) comprennent un manchon intérieur fileté intérieurement (8b1) et un manchon extérieur (8b2), conçus pour être couplés intérieurement avec ledit manchon intérieur (8b1).

7. Dispositif selon la revendication 6, dans lequel ladite barre d'ajustement (10) comprend une partie filetée (10a) traversant lesdits moyens d'accouplement (8b) ou leur manchon intérieur (8b1), dans lequel lesdits moyens d'accouplement (8b) sont fixés à ladite partie tubulaire (7), et/ou dans lequel lesdits moyens d'accouplement (8b) ou leur manchon intérieur (8b1) comporte un filet à pas intérieur correspondant au pas de filetage de ladite partie (10a) de ladite barre (10) et/ou dans lequel ladite barre d'ajustement (10) comporte une partie d'extrémité (10b) montée de manière rotative dans les moyens d'accouplement (8a) ou dans leur manchon extérieur (8a2), dans lequel lesdits moyens d'accouplement (8a) sont fixés audit collier de support (2) .

8. Dispositif selon la revendication 6 ou la revendication 7, dans lequel lesdits manchons extérieurs (8a2, 8b2) desdits moyens d'accouplement (8a, 8b) comportent une partie plate (8a3, 8b3) au niveau d'une paroi latérale cylindrique de ceux-ci.

9. Dispositif selon les revendications 6 à 8, comprenant des moyens (12) pour verrouiller ladite barre (10) en position, de telle sorte que, à l'ajustement de la position de ladite partie tubulaire (7) par rapport audit collier de support (2), ladite position ne change pas dans le temps et dans lequel lesdits moyens de verrouillage (12) de position comprennent au moins une paire de vis (12a, 12b), chacune pouvant être vissée dans une ouverture filetée correspondante obtenue à cet effet dans un moyen d'accouplement respectif desdits moyens d'accouplement (8a, 8b) ou dans les parties plates (8a3, 8b3) de ceux-ci, de telle sorte que chaque vis (12a, 12b) de ladite paire arrive en butée contre ladite partie d'extrémité (10b) de ladite barre (10) ou sur ledit manchon intérieur (8bl) desdits moyens d'accouplement (8b) .

10. Procédé d'accordage d'un instrument de musique à tuyau, comprenant les étapes suivantes :

- fourniture d'un dispositif d'accordage selon l'une des revendications 1 à 9 pour chaque tuyau qui doit être réglé,
- application d'un collier de support (2) sur chaque tuyau (C) à une distance prédéterminée depuis une extrémité supérieure de celui-ci, dans lequel ledit collier de support (2) a une forme annulaire et délimite une région ayant une section transversale correspondant sensiblement à une dimension globale transversale dudit tuyau (C),
- application d'une partie tubulaire (7) à ladite

extrémité supérieure dudit tuyau (C), dans lequel ledit collier de support (2) et ladite partie tubulaire (7) sont positionnés à l'extérieur du tuyau (C),

- accouplement dudit collier de support (2) et de ladite partie tubulaire (7) l'un à l'autre en utilisant des moyens (8) configurés pour régler une distance entre ladite partie tubulaire (7) et ledit collier de support (2), et
- réglage de ladite distance entre ladite partie tubulaire (7) et ledit collier de support (2) de telle sorte que ladite partie tubulaire (7) soit saillante par rapport à ladite extrémité supérieure en fonction de la fréquence transmise désirée, pendant l'utilisation, par ledit tuyau (C).

11. Procédé selon la revendication 10, dans lequel ladite étape d'application dudit collier de support (2) sur chacun desdits tuyaux (C) comprend une étape de serrage dudit collier de support (2), en fixant lesdits moyens de verrouillage (4) autour de deux oreilles ou fentes (6), de telle sorte qu'ils soient correctement fixés audit tuyau.

12. Procédé selon la revendication 10 ou 11, dans lequel ladite étape de réglage de ladite distance comprend le coulissement longitudinal de ladite partie tubulaire (7) par rapport audit collier de support (2) en modifiant la hauteur globale dudit tuyau (C) et/ou dans lequel ladite étape de coulissement longitudinal de ladite partie tubulaire (7) par rapport audit collier de support (2) comprend le vissage d'une barre d'ajustement (10) desdits moyens d'ajustement (8).

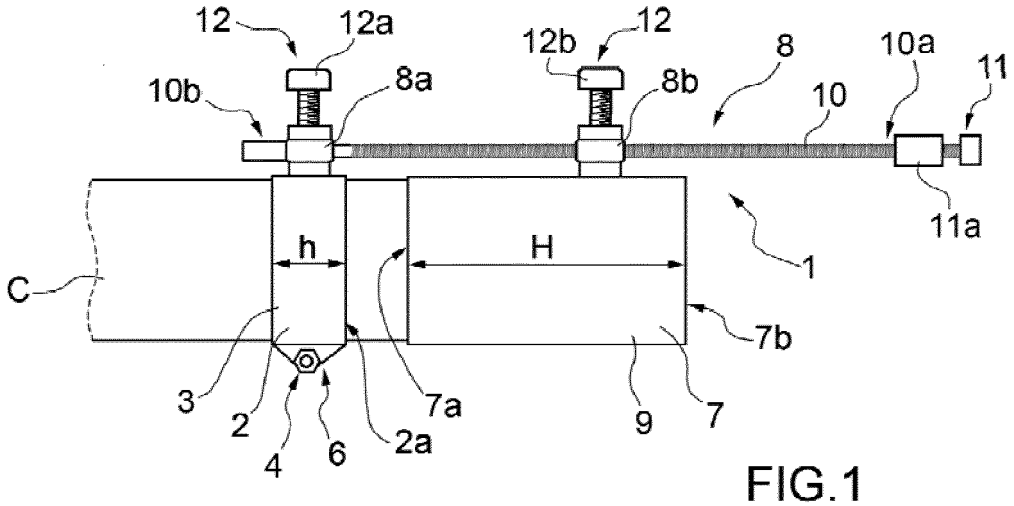

12
12a
12b
12
8
10a
11
10b
8a
8b
10
11a
h
H
1
C
7b
3
2
4
6
2a
7a
9
7

FIG.1

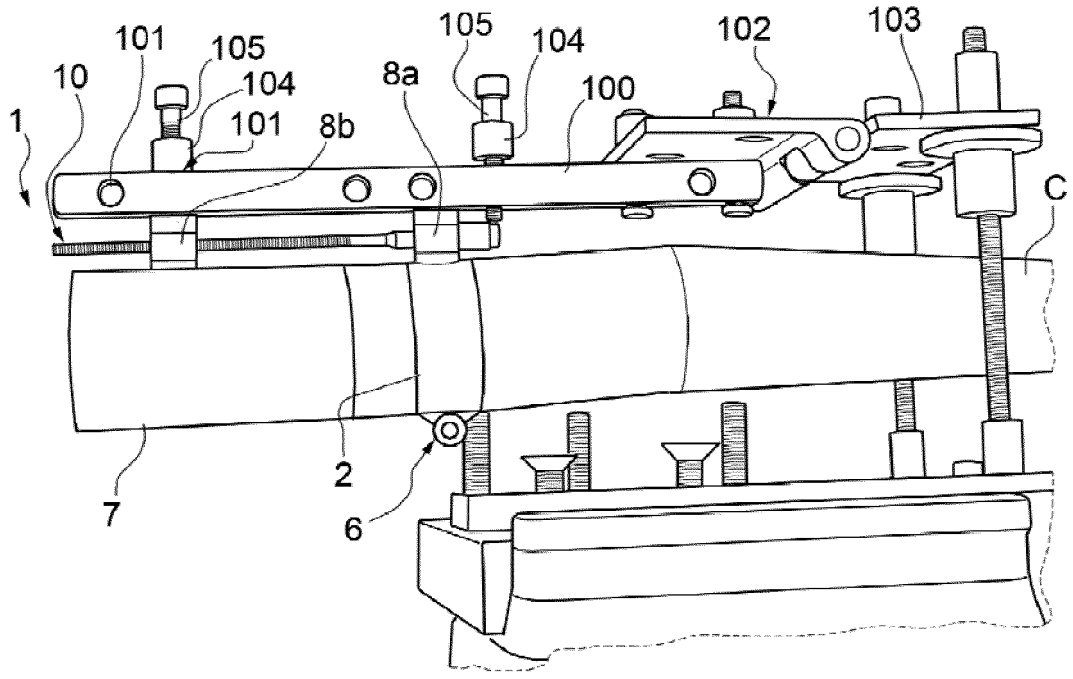

101
105
105
104
102
103
10
104
8a
100
1
101
8b
C
2
7
6

FIG.2

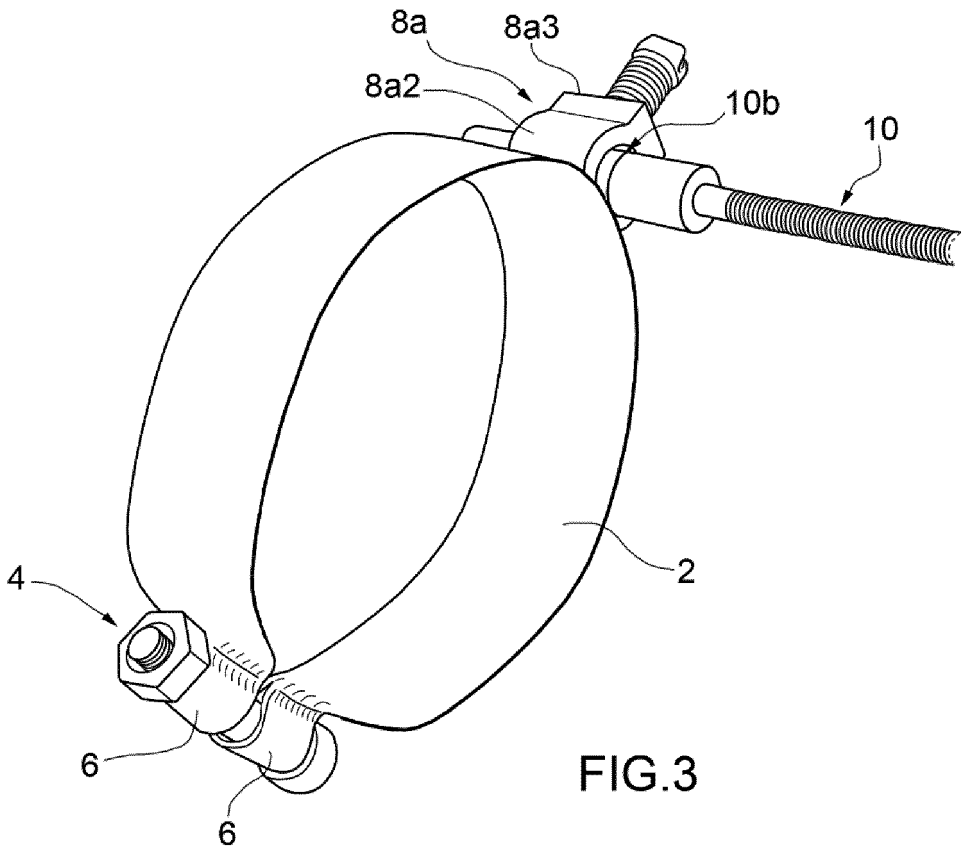


FIG.3

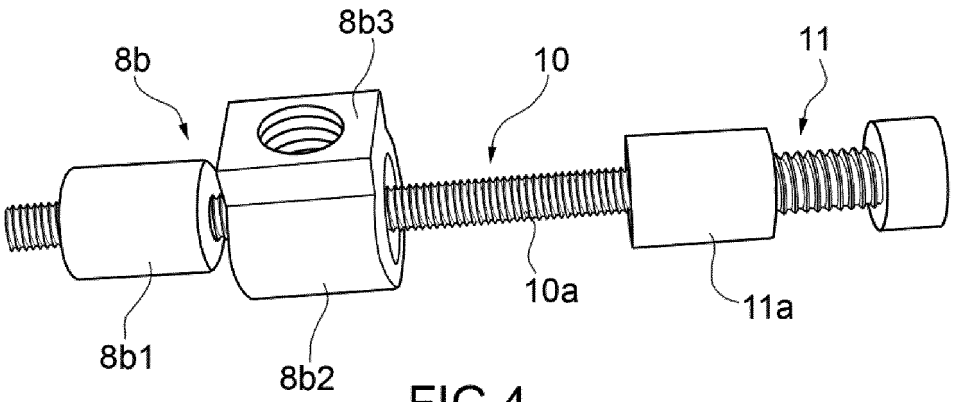


FIG.4

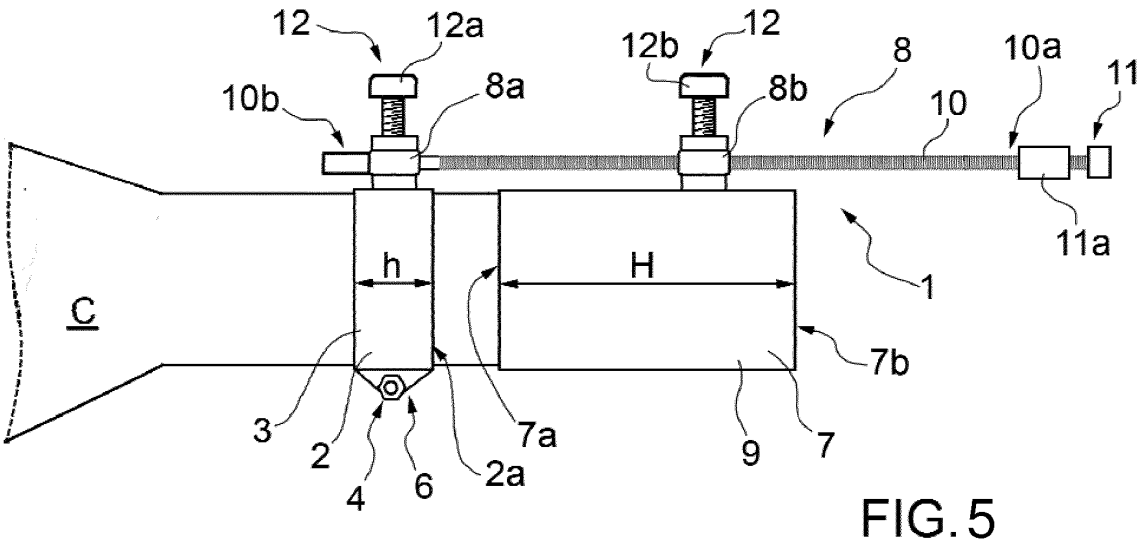

12
12a
12b
12
8
10a
11
10b
8a
8b
10
11a
h
H
1
C
7b
3
2
7a
9
7
4
6
2a

FIG. 5

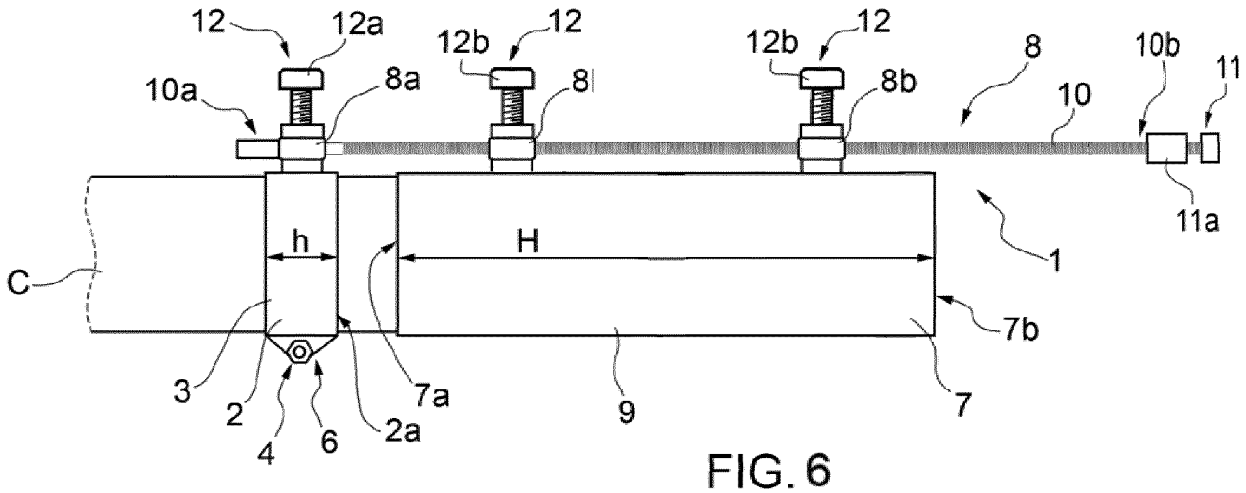

12
12a
12b
12
12b
12
8
10b
11
10a
8a
8b
10
11a
h
H
1
C
7b
3
2
7a
9
7
4
6
2a

FIG. 6

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- US 154022 A **[0010]**