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(54) **RETRACTABLE MICROPHONE ASSEMBLY**

(57) Tre present invention relates to a retractable microphone assembly, which comprises a housing (1) having an elongated through opening (3), a microphone (M) having an elongated body with a base (Mb) hinged to a structural member to move by rotating about a first axis (C) between a retracted position and an extended position. The assembly comprises means for straighten out the elongated body of the microphone (M) while moving from the extended position to the retracted position, so that the microphone (M) is finally placed straight within the housing (1).

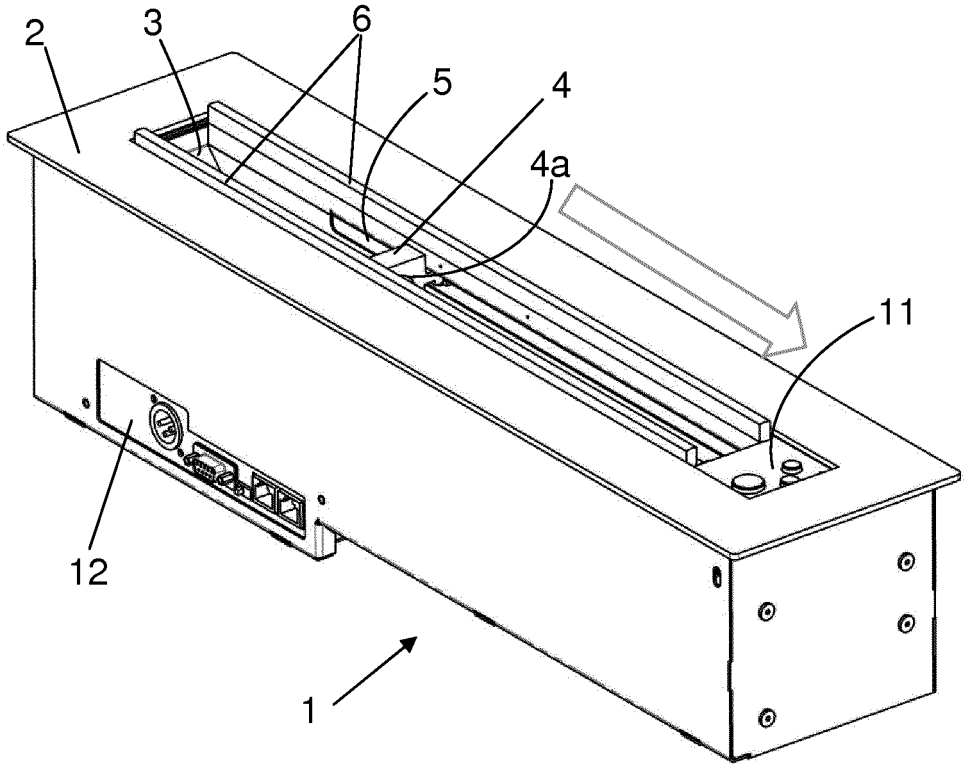

Fig. 1

EP 3 200 473 A1

Description

[0001] The present invention generally relates to a retractable microphone assembly, which moves from/to a retracted position to/from an extended position by rotating about an axis, and more specifically to an assembly allowing the straightening out the microphone.

Background of the invention

[0002] Retractable microphone assemblies which comprise a housing having an elongated through opening, a microphone having an elongated body with a base hinged to a structural member to move by rotating about a first axis between a retracted position at which the microphone is housed inside said housing and an extended position at which at least a portion of the elongated body of the microphone projects out of said housing through said elongated through opening, and vice versa, are known in the state art.

[0003] Korean patent document KR100653868 discloses one of said known assemblies, where the assembly is embedded in a desk, within a housing placed below an upper wall or frame of the desk, accessible through an opening which can be covered by a hinged cover. The microphone of the assembly disclosed in said Korean patent document is automatically rotated by a motor about a rotation axis, from a retracted position where the microphone remains horizontal to an extended position where it remains vertical, and vice versa.

[0004] KR100653868 disclose the features defined in the preamble clause of claim 1 of the present invention.

[0005] The microphone disclosed in KR100653868 is of a "gooseneck" type, i.e. having a flexible portion which allows it to be oriented by the speaker as desired.

[0006] Due to that user desired orientation, once the microphone must return to its retracted position it is usually bent, and needs to be straighten out before going to the retracted position in order to pass through the elongated through opening defined in the desk upper wall and fit into the housing.

[0007] This task must be performed manually by a user exerting force on the microphone, in the known retractable microphone assemblies of this type, including the one proposed by KR100653868.

[0008] It is, therefore, necessary to provide an alternative to the state of the art which covers the gaps found therein, particularly focused on the above mentioned need for straighten out the microphone before entering the housing when going to the retracted position.

Description of the invention

[0009] To that end, the present invention relates to a retractable microphone assembly, which comprises, in a known manner, a housing having an elongated through opening, a microphone having an elongated body with a base hinged to a structural member to move by rotating about a first axis between a retracted position at which the microphone is housed inside said housing and an extended position at which at least a portion of the elongated body of the microphone projects out of said housing through said elongated through opening, and vice versa.

[0010] In contrast to the known retractable microphone assemblies, the one proposed by the present invention comprises, in a characteristic manner, means for straighten out the elongated body of the microphone while moving from the extended position to the retracted position, so that the microphone is finally placed straight within the housing.

[0011] For a preferred embodiment, the retractable microphone assembly of the present invention is embeddable in a desk or other kind of table, whether over or under an opening defined in a board of the desk, preferably the one constituting the desk table top.

[0012] For other embodiments, the retractable microphone assembly of the present invention is embeddable in a board or surface of other kind of furniture or structural member, such as a wall.

[0013] For an embodiment, the housing comprises a wall where said elongated through opening is defined. This embodiment is particularly applicable where the assembly is to be mounted embedded in a board (such as the top board of a desk) over a through opening defined therein, remaining said wall preferably flush with said board over the contour of the through opening thereof.

[0014] For another embodiment, the housing does not have said wall, and the elongated through opening is then defined by the upper edges of corresponding side walls of the housing. This embodiment is particularly applicable where the assembly is to be mounted embedded in or fixed to a board (such as the top board of a desk) under a through opening defined therein, attaching the housing to the bottom surface of the board, for example by its side walls.

[0015] For other embodiments, the retractable microphone assembly of the present invention is surface mountable, in a desk, wall, or any kind of board.

[0016] For an embodiment, the elongated body of the microphone travels an angular distance of substantially 90º between the retracted and the extended position, such that when mounted embedded in a desk or table, the elongated body of the microphone remains substantially horizontal when in the retracted position and substantially vertical (or tilted) when in the extended position. Obviously if the assembly is embedded in a non-horizontal element, the elongated body of the microphone won't be horizontal and vertical when in the, respectively, retracted and extended position. For example, if the assembly is embedded in a vertical element, such as a wall, the elongated body of the microphone may be in a substantially vertical position when in the retracted position and in a horizontal or tilted position when in the extended position.

[0017] Optionally, the retractable microphone assembly comprises a cover for the elongated through opening.

[0018] According to an embodiment, the elongated body of the microphone is movable along at least a further path which is different to a path along which it displaces when moving about said first axis, the displacement along said further path causing the elongated body of the microphone, when in said extended position, to adopt a pose or form needing said straighten out in order to be able to pass through said elongated through opening to go to the retracted position.

[0019] The microphone is movable along at least said further path due to one or more hinges or pivoting axis other than said first axis, which can be implemented by any known mechanism, depending on the embodiment.

[0020] However, for a preferred embodiment, at least a portion of the elongated body of the microphone is flexible, so that the microphone can bend by said flexible part to move along said further and other paths to adopt a plurality of bent positions at which the microphone adopts corresponding different spatial orientations, such that a speaker can take the microphone and orient it towards him/her by bending it through said flexible portion, the above mentioned straighten out causing the reversing of the microphone to an unbent position.

[0021] For a preferred embodiment, the above mentioned means for straighten out comprise a movable member (or more than one) configured and arranged inside the housing to move linearly guided between a first position and a second position, and vice versa, the movable member being mounted with respect to the microphone so that at said first position the microphone is free to rotate about the above mentioned first axis, and for a plurality of consecutive positions along the travel of the movable member towards said second position the movable member exerts a force on the elongated body of the microphone to gradually straighten it out from its lower regions, closer to its base, to its upper regions, closer to its tip.

[0022] Alternatively or complementarily to the above mentioned preferred embodiment, the means for straighten out comprise other kind of mechanisms, such as roller mechanisms, pneumatic mechanisms, the use of shape memory materials for the manufacturing of the elongated body of the microphone, etc.

[0023] According to an embodiment, the movable member is configured and arranged to block, at the above mentioned second position, the movement of the microphone towards its extended position.

[0024] For a preferred embodiment, the retractable microphone assembly comprises driving means connected to the movable member to automatically move it from the first to the second position, and vice versa, under the control of electric and/or electronic control means.

[0025] Alternatively, but less preferably, the movable member can be moved manually by a user exerting a force thereon.

[0026] Also preferably, the retractable microphone assembly of the present invention comprises main driving means connected to the microphone to move it from the retracted to the extended position, and vice versa.

[0027] Alternatively, but less preferably, the microphone can be moved manually, at least from the retracted position towards the extended position, by a user exerting a force thereon.

[0028] For an embodiment, the above mentioned main driving means comprise a locking mechanism for locking the microphone in the extended position.

[0029] For a variant of said embodiment, the main driving means also comprise a motor kinematically connected to the microphone and automatically controllable by electric and/or electronic control means, the above mentioned locking mechanism allowing the movement of the microphone to the retracted position when performed by means of said motor, i.e. only locking the manual movement of the microphone by a user but not the automatic movement thereof.

[0030] For an implementation of said variant of the above mentioned embodiment, the cited motor is a rotary motor, the main driving means comprise a kinematic chain through which the motor is connected to the base of the elongated body of the microphone, and the kinematic chain comprises an offset slider-crank mechanism comprising:

- a crank having a first end firmly connected to a rotating shaft of the motor so that said crank is rotated thereby, and
- a connecting rod having a first end pivotably connected, though a first pivot connection, to a second end of said crank and a second end pivotably connected, through a second pivot connection, to a point of the base of the elongated body of the microphone, or of a support connected thereto, said point being eccentric with respect to the first axis, so that said connecting rod, by being pulled by said crank, moves to pull/push the base of the elongated body of the microphone to rotate it about the first axis towards, respectively, the extended/retracted position.

[0031] Generally, said offset slider-crank mechanism is arranged to constitute the above mentioned locking mechanism, such that when the rotation axis of the first pivot connection, the rotation axis of the rotating shaft and the rotation axis of the second pivot connection are arranged such that the microphone is at the extended position and the offset slider-crank mechanism is substantially at its inner dead centre or near enough so that the movement of the microphone when exerting a manual force thereon above the first axis is blocked by the offset slider-crank mechanism.

[0032] Although the above mentioned embodiment related to the inclusion of a locking mechanism in the main driving means, and the described variant and implementation thereof, have been described as depending on the present invention, i.e. on a retractable microphone assembly comprising the above mentioned means for straighten out, they may constitute an independent as-

pect in itself related to a retractable microphone assembly not comprising the means for straighten out but comprising the described locking mechanism.

[0033] Regarding the above mentioned electric and/or electronic means, depending on the embodiment, they are wholly implemented locally (i.e. included in the retractable microphone assembly of the invention), wholly implemented remotely (i.e. external to the assembly of the invention), or, preferably, in part locally and in part remotely, said local and remote parts being wired or wireless communicated with each other.

Brief description of the drawings

[0034] The previous and other advantages and features will be more fully understood from the following detailed description of embodiments, with reference to the attached drawings, which must be considered in an illustrative and non-limiting manner, in which:

Figure 1 shows a perspective view of the retractable microphone assembly according to an embodiment of the invention, where the microphone is retracted hidden within the depicted housing.

Figure 2 shows a perspective view of the assembly of the invention for the same embodiment as Figure 1, but illustrating the microphone in a fully extended position (in solid lines) and in partially extended position (in dashed lines).

Figure 3 shows a further perspective view of the assembly of the invention for the same embodiment as Figures 1 and 2, but illustrating the microphone in a bent position which impedes its entrance into the housing through the elongated through opening.

Figure 4 is a side view which shows some of the elements of the assembly of the invention contained within the housing, for an embodiment, including the microphone and the offset slider-crank mechanism associated thereto, showing the microphone in its retracted position.

Figure 5 is a side view analogous to the one of Figure 4 but showing the microphone in its extended position.

Description of a preferred embodiment

[0035] As shown in the appended Figures, the present invention relates to a retractable microphone assembly, which comprises a housing 1 (shown in Figures 1 to 3) with a wall 2 having an elongated through opening 3, a microphone M having an elongated body with a base Mb hinged to a structural member to move by rotating about a first axis C (indicated in Figures 4 and 5) between a retracted position at which the microphone M is housed inside said housing 1 at a substantially horizontal position (as shown in Figure 4) and an extended position at which most of the elongated body of the microphone M projects out of said housing 1 through said elongated through opening 3 at a substantially vertical position (as shown in Figures 2 and 5), and vice versa.

[0036] Generally, the above mentioned structural member (not shown) is placed within the housing 1 or forms part of the latter.

[0037] For the embodiment shown in Figs. 2 and 3, a portion Mf of the elongated body of the microphone M is flexible, so that the microphone M can bend by said flexible part Mf (as indicated by the line curved arrow in Figure 3) to adopt a plurality of bent positions at which the microphone M adopts corresponding different spatial orientations. In Figure 3, the microphone M is depicted at one of said bent positions, showing how, because of that bent position, the microphone M is prevented from entering into the housing 1 through the elongated through opening 3.

[0038] In order to cope with that problem, the assembly of the present invention comprises means for straighten out the elongated body of the microphone M while moving from the extended position to the retracted position, so that the microphone M is finally placed straight within the housing 1.

[0039] For the embodiment illustrated in Figures 1 to 3, the means for straighten out comprise a movable member 4 configured and arranged inside the housing 1 to move linearly guided between a first position where is hidden within the housing 1 (situation illustrated in Figure 1) and a second position, and vice versa, through longitudinal guides 5. The movable member 4 is mounted with respect to the microphone M so that at said first position the microphone M is free to rotate about the first axis C (as shown in Figure 2), and for a plurality of consecutive positions along the travel of the movable member 4 towards said second position the movable member 4 exerts a force on the elongated body of the microphone M to gradually straighten it out from its lower regions, closer to its base Mb, to its upper regions, closer to its tip Ma.

[0040] As shown in Figures 1 and 3, the movable member 4 has a through opening 4a through which the elongated body of the microphone M is inserted for said plurality of consecutive positions along the travel of the movable member 4 towards the second position, so that contour regions of said through opening 4a of the movable member 4 contact and push different regions of the elongated body of the microphone M to cause said straighten out of the same.

[0041] At the situation depicted in Figure 1, the microphone M is at its retracted position (not shown because is hidden within the housing) and the movable member 4 is at its second position at which it blocks the movement of the microphone M towards its extended position.

[0042] In operation, in order to move the microphone M to its extended position, first the movable member 4 is automatically moved from its second position towards its first position, thus unblocking the microphone M and allowing it to rotate about the first axis C. Then, the microphone M automatically rotates about the first axis C to the extended position, as shown in Figure 2.

[0043] At said extended position, the user orientates the microphone towards him/her and thus makes the microphone M adopt a bent position which, as shown in Figure 3, prevents it from passing through the elongated through opening 3 towards its retracted position. Then, to overcome that problem, the automatic rotation of the elongated body about the first axis C towards the horizontal position is synchronized with the automatic displacement of the movable member 4 towards its second position, being thus the microphone M straighten out while going towards its retracted position.

[0044] As shown in Figures 1 to 3, two protecting barriers 6 project out of the housing 1 through the elongated through opening 3, each adjacent to a respective large perimetric side of the elongated through opening 3 so that, when going to the retracted position, if the elongated body of the microphone M has not yet been straighten out enough to pass freely through the elongated through opening 3, it contacts said protecting barriers 6 instead of the contour of the through opening 3. Said protecting barriers 6 are made of a material, such as plastic, which do not damage the microphone M if that contact is produced.

[0045] The assembly of the invention comprise driving means connected to the movable member 4 to automatically move it from the first to the second position, and vice versa, under the control of electric and/or electronic control means. Said driving means comprise, for the embodiment illustrated in Figures 4 and 5, an electric rotary motor 14 and a kinematic chain through which the rotary motion of the motor 14 causes the movable member 4 to be linearly displaced. The kinematic chain includes a toothed pulley 15 couplet to the shaft of the motor 14, a plurality of pulleys p and an endless conveyor belt 13 stretched between the pulleys p, the movable member 14 being attached to the endless conveyor belt 13 to be moved by the latter.

[0046] Figures 4 and 5 show main driving means of the assembly of the invention which are connected to the microphone M to move it from the retracted to the extended position, and vice versa.

[0047] For the depicted embodiment, the main driving means comprise a rotary motor 10 (generally an electric gear motor) kinematically connected to the microphone M and automatically controllable by electric and/or electronic control means (not shown), the main driving means comprising a kinematic chain through which the motor 10 is connected to the base Mb of the elongated body of the microphone M, particularly to a support 9 thereof, said kinematic chain comprising an offset slider-crank mechanism comprising:

- a crank 7 having a first end firmly connected to a rotating shaft E of the motor 10 to be rotated thereby, and
- a connecting rod 8 having a first end pivotably connected, though a first pivot connection F, to a second end of said crank 7 and a second end pivotably connected, through a second pivot connection D, to a point of the support 9 of the base Mb of the elongated body of the microphone M, said point being eccentric with respect to the first axis C, so that said connecting rod 8, by being pulled by the crank 7, moves to pull/push the base Mb of the elongated body of the microphone M to rotate it about the first axis C towards, respectively, the extended/retracted position.

[0048] The offset slider-crank mechanism is arranged to constitute a locking mechanism, such that when the rotation axis of the first pivot connection F, the rotation axis of the rotating shaft E and the rotation axis of the second pivot connection D are arranged such that the microphone M is at the extended position (Figure 5) and the offset slider-crank mechanism is substantially at its inner dead centre or near enough so that the movement of the microphone M when exerting a manual force thereon above the first axis C (for example by a user from the exterior of the housing 1) is blocked by the offset slider-crank mechanism. The rotation of the motor unlocks the movement of the microphone M, which can then be moved towards its retracted position (shown in Figure 4).

[0049] At the position depicted in Figure 5, the offset slider-crank mechanism is not at its inner dead centre, but is near enough to perform the above mentioned blocking of the manual movement of the microphone M, as the force that should be exerted thereon (taking into account also the resistive torque of motor 10) is high enough to prevent said manual movement. This force increases exponentially when approaching the inner dead centre.

[0050] For the illustrated embodiment, the assembly of the invention comprise part of the above mentioned electric and/or electronic means, such as a push-button dashboard 11 or a connection dashboard 12 (including electric and data sockets).

[0051] A person skilled in the art could introduce changes and modifications in the embodiments described without departing from the scope of the invention as it is defined in the attached claims.

Claims

1. Retractable microphone assembly, which comprises a housing (1) having an elongated through opening (3), a microphone (M) having an elongated body with a base (Mb) hinged to a structural member to move by rotating about a first axis (C) between a retracted position at which the microphone (M) is housed inside said housing (1) and an extended position at which at least a portion of the elongated body of the microphone (M) projects out of said housing (1) through said elongated through opening (3), and vice versa, **characterised in that** it comprises means for straighten out the elongated body of the microphone (M) while moving from the extended position to the

retracted position, so that the microphone (M) is finally placed straight within the housing (1).

2. Retractable microphone assembly according to claim 1, wherein the elongated body of the microphone (M) is movable along at least a further path which is different to a path along which it displaces when moving about said first axis (C), the displacement along said further path causing the elongated body of the microphone (M), when in said extended position, to adopt a pose or form needing said straighten out in order to be able to pass through said elongated through opening (3) to go to the retracted position.

3. Retractable microphone assembly according to claim 2, wherein at least a portion (Mf) of the elongated body of the microphone (M) is flexible, so that the microphone (M) can bend by said flexible part (Mf) to move along at least said further path to adopt a plurality of bent positions at which the microphone (M) adopts corresponding different spatial orientations, said straighten out causing the reversing of the microphone (M) to an unbent position.

4. Retractable microphone assembly according to any of the previous claims, wherein said means for straighten out comprise at least one movable member (4) configured and arranged inside said housing (1) to move linearly guided between a first position and a second position, and vice versa, said at least one movable member (4) being mounted with respect to the microphone (M) so that at said first position the microphone (M) is free to rotate about said first axis (C), and for a plurality of consecutive positions along the travel of the at least one movable member (4) towards said second position the at least one movable member (4) exerts a force on the elongated body of the microphone (M) to gradually straighten it out from its lower regions, closer to its base (Mb), to its upper regions, closer to its tip (Ma).

5. Retractable microphone assembly according to claim 4, comprising a linear guide (5) within said housing (1) through which said at least one movable member (4) is guided, the movable member (4) having a through opening (4a) through which the elongated body of the microphone (M) is inserted for said plurality of consecutive positions along the travel of the at least one movable member (4) towards said second position, so that contour regions of said through opening (4a) of the at least one movable member (4) contact and push different regions of the elongated body of the microphone (M) to cause said straighten out of the same.

6. Retractable microphone assembly according to claim 5, wherein said at least one movable member (4) is configured and arranged to block, at said second position, the movement of the microphone (M) towards its extended position.

7. Retractable microphone assembly according to any of claims 4 to 6, comprising driving means connected to said at least one movable member (4) to automatically move it from the first to the second position, and vice versa, under the control of electric and/or electronic control means.

8. Retractable microphone assembly according to any of the previous claims, wherein two protecting barriers (6) project out of the housing (1) through the elongated through opening (3), each adjacent to a respective large perimetric side of the elongated through opening (3) so that, when going to the retracted position, the elongated body of the microphone (M) contacts said protecting barriers (6) instead of the contour of the through opening (3).

9. Retractable microphone assembly according to any of the previous claims, comprising main driving means connected to said microphone (M) to move it from the retracted to the extended position, and vice versa.

10. Retractable microphone assembly according to the preceding claim, wherein said main driving means comprise a locking mechanism for locking the microphone (M) in the extended position.

11. Retractable microphone assembly according to claim 10, wherein the main driving means also comprise a motor (10) kinematically connected to the microphone (M) and automatically controllable by electric and/or electronic control means, said locking mechanism allowing the movement of the microphone (M) to the retracted position when performed by means of said motor (10).

12. Retractable microphone assembly according to claim 11, wherein said motor (10) is a rotary motor, said main driving means comprise a kinematic chain through which the motor (10) is connected to the base (Mb) of the elongated body of the microphone (M), and said kinematic chain comprises an offset slider-crank mechanism comprising:

- a crank (7) having a first end firmly connected to a rotating shaft (E) of the motor (10) so that said crank (7) is rotated thereby, and
- a connecting rod (8) having a first end pivotably connected, though a first pivot connection (F), to a second end of said crank (7) and a second end pivotably connected, through a second pivot connection (D), to a point of the base (Mb) of the elongated body of the microphone (M), or of

a support (9) connected thereto, said point being eccentric with respect to the first axis (C), so that said connecting rod (8), by being pulled by said crank (7), moves to pull/push the base (Mb) of the elongated body of the microphone (M) to rotate it about the first axis (C) towards, respectively, the extended/retracted position.

13. Retractable microphone assembly according to claim 12, wherein said offset slider-crank mechanism is arranged to constitute said locking mechanism, such that when the rotation axis of the first pivot connection (F), the rotation axis of the rotating shaft (E) and the rotation axis of the second pivot connection (D) are arranged such that the microphone (M) is at the extended position and the offset slider-crank mechanism is substantially at its inner dead centre or near enough so that the movement of the microphone (M) when exerting a manual force thereon above the first axis (C) is blocked by the offset slider-crank mechanism.

14. Retractable microphone assembly according to any of the previous claims, wherein the elongated body of the microphone (M) travels an angular distance of substantially 90º between the retracted and the extended position.

15. Retractable microphone according to claim 7 or 11, comprising at least part of said electric and/or electronic means.

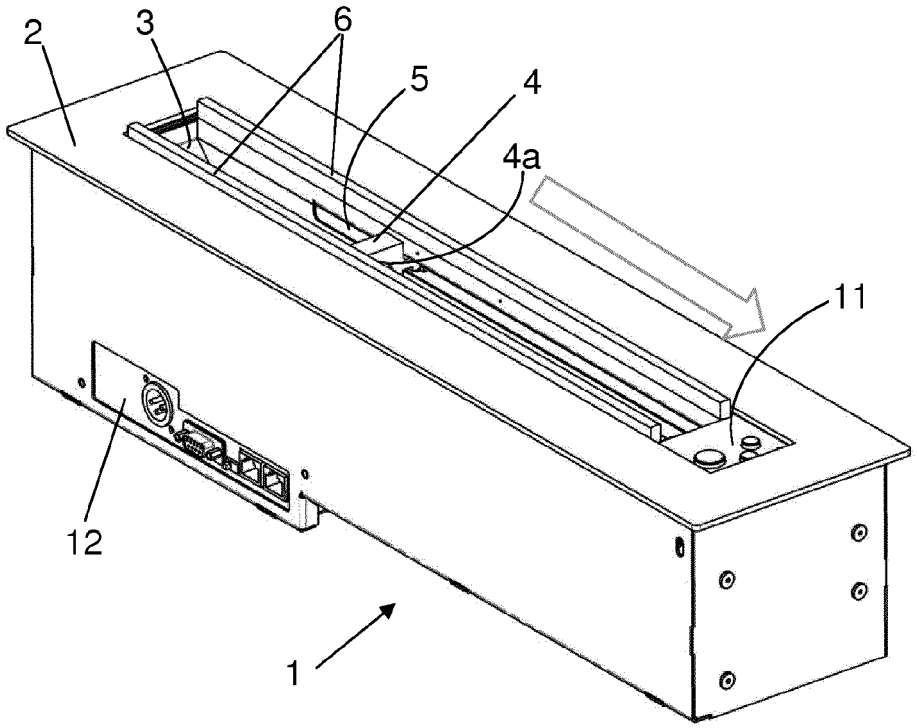

Fig. 1

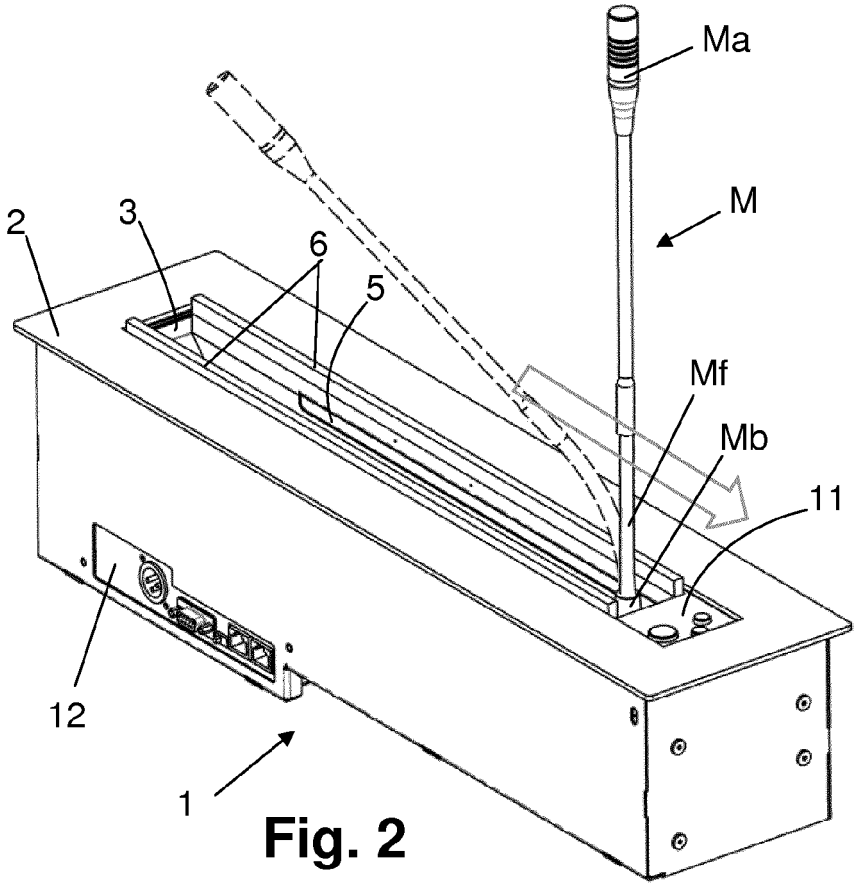

Fig. 2

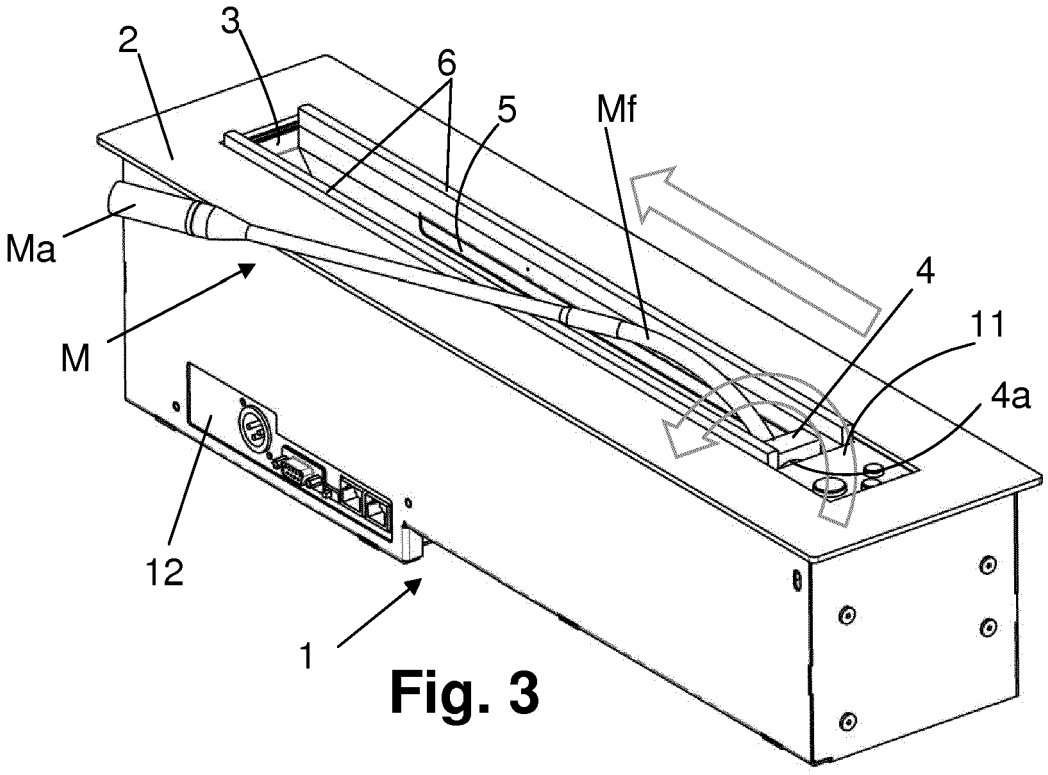

Fig. 3

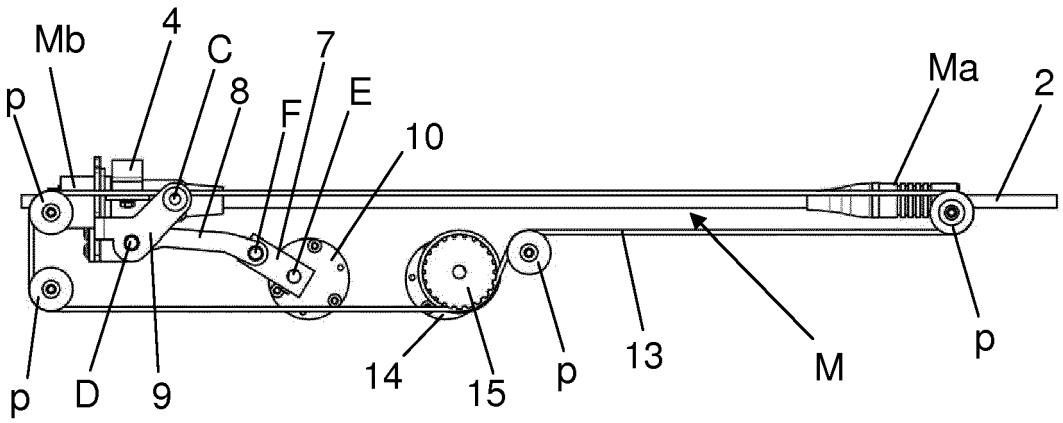

Fig. 4

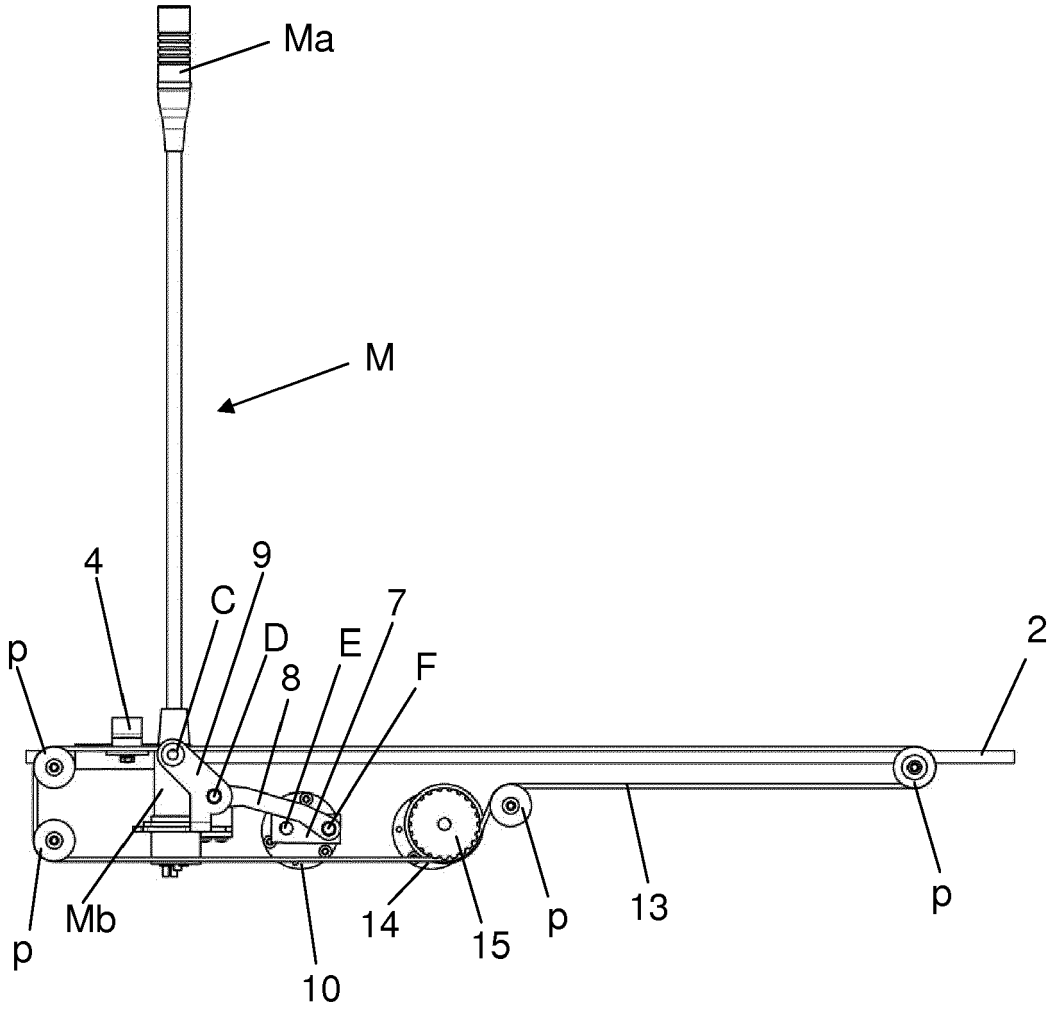

Fig. 5

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EUROPEAN SEARCH REPORT

Application Number
EP 16 38 2032

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	WO 2004/112426 A1 (BSE CO LTD [KR]; KIM JUNG-MIN [KR]; CHO KEUM-HAENG [KR]; LEE SANG-HO [) 23 December 2004 (2004-12-23) * the whole document *	1-15	INV. H04R1/08
A	WO 2008/013354 A1 (SLAUDIOLAB CO LTD [KR]; LEE SIN-LYUL [KR]) 31 January 2008 (2008-01-31) * page 3, line 10 - page 9, line 10 *	1-15	

TECHNICAL FIELDS SEARCHED (IPC)
H04R

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	27 June 2016	Coda, Ruggero

CATEGORY OF CITED DOCUMENTS

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

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