The invention relates to an apparatus (110) for performing at least one electrical or electromechanical function, preferably a communication function. The apparatus (110) comprises at least one housing (112) and at least one pushbutton (120). The housing (112) comprises at least one first hinge element (144), and the pushbutton (120) comprises at least one second hinge element (128). The first and second hinge elements (144, 128) are adapted to interact as a hinge (164) in an assembled state of the apparatus (110). In a preferred embodiment, the first hinge element (144) and the second hinge element (128) are adapted to allow for an assembly and/or disassembly of the hinge in a first position (160) and are adapted to prevent a disassembly in at least one second position (168), wherein the at least one second position (168) differs from the first position (160). The at least one second position (168) preferably comprises an operation position of the pushbutton (120).
Description

Title

Hinge for a button assembly

Prior art

The invention is based on apparatuses as known from several applications in technical surroundings and known to persons skilled in the art, which are adapted for performing at least one electrical or electromechanical function. As an example, to which the present invention is not limited, the invention refers to discussion units, which may be used in discussion systems, communication systems or conference systems, as may be found in modern conference rooms and conference centres. Examples of conference systems as well as their assembly are given inWO 2007/028423 Al.

These conference units and conference systems are used to facilitate discussions between participants of conferences or meetings. The conference systems typically are installed permanently or non-permanently in the conference rooms for private or public use. These conference systems typically are adapted to allow for a speaker to give a speech using a microphone, and for a chairman of the conference to control the speech, such as by switching on or off the speaker's microphone.

Conference systems typically have to satisfy a large number of requirements. Thus, one requirement is that well-established public conference rooms as well as private conference rooms of enterprises and firms take pride in an "upscale" ambience. Thus, the integration of sophisticated electronic components, such as the conference systems known from prior art, typically are rather challenging with respect to interior design aspects. The looks of the conference system have to be matched with furnishings and decorating, as well as with the spirit, the owner of the conference rooms wants to create. Thus, conference systems usually are to be delivered by the manufacturer with number of options regarding the design, in order to match the furniture and/or the decoration of the conference rooms.

This again imposes on the manufacturer the pressure to provide a conference system in a large variety of designs, creating a significant amount of extra cost with regard to the manu-
facturing, stocking and distribution. Therefore, there is a need for conference systems with a reduced number of parts, as well as with a rather simplified assembly operation with regard to housing components. Further, especially in the field of public building projects, a significant increase in cost pressure has occurred. Thus, conference systems have to be simplified with regard to manufacturing as well as assembly costs.

Disclosure of the invention

The invention refers to an apparatus for performing at least one electrical or electromechanical function. Generally, the invention may be applied to a large number of apparatuses. Nevertheless, due to the challenges and requirements of this kind of apparatuses, it is preferred to apply the apparatus according to the invention to the use in discussion units as a part of communication systems or conference systems as described above. Nevertheless, other applications are possible.

The apparatus is adapted for performing at least one electrical or electromechanical function. This at least one electrical or electromechanical function may e.g. be a communication function, such as switching on or off a microphone or a speaker, or any other function as known from prior art communication systems.

The apparatus comprises at least one housing, wherein the housing may comprise one or more housing components. Thus, e.g., the housing may be formed of metal and/or plastics components, such as injection-moulded thermoplastic housing components. Further, the apparatus comprises at least one pushbutton. This pushbutton may be used, e.g., to initiate the at least one electrical and/or electromechanical function of the apparatus, such as for switching on or off a speaker phone. Other functions may be possible. The term "pushbutton" mainly refers to actions initiated by mechanically pushing, i.e. moving downward, any kind of button, such as by applying force by using a fingertip. Nevertheless, alternatively or additionally, other types of actuations and buttons are possible and to be comprised by the term pushbutton, such as a lever movement, a turning movement or similar movements. The apparatus may comprise one or more of said pushbuttons.

The housing further comprises at least one first hinge element, wherein the pushbutton comprises at least one second hinge element. These first and second hinge elements are adapted to interact as a hinge in an assembled state of the apparatus. Thus, the hinge comprising the first and the second hinge elements, connects the pushbutton and the remainder of the housing and allows for the pushbutton to be operated by applying pressure to the pushbutton and, thereby, applying torque to the hinge.
This hinged button design according to the invention provides a large number of advantages over pushbutton designs as known from prior art apparatuses. Thus, as it turned out a hinge design greatly simplifies the assembly procedure of the apparatus, which, as explained above, is essential in systems requiring a cost-effective and fast exchange of components, e.g. for design purposes.

In a preferred embodiment, the first hinge element and the second hinge element are adapted to allow for an assembly and/or disassembly of a hinge in a first position and are adapted to prevent a disassembly in at least one second position, wherein the at least one second position differs from the first position. This embodiment of the invention allows for a simple assembly and/or a disassembly procedure of the apparatus. Thus, the expression "position" includes any possible orientation of the first and second hinge elements relative to each other in space, including lateral translations and angular orientations or turns. Thus, preferably, the first and second positions differ by an angular orientation of the pushbutton with regard to the housing of the apparatus. The second position preferably comprises an operation position of the pushbutton, i.e. a position in which a user of the apparatus may operate the pushbutton. Thus, in this embodiment, the first position is an assembly position, wherein the second position may comprise one or more operation positions of the pushbutton.

Preferably, the first and second positions are located in such a way that a turning of the hinge by an angle of at least 90°, preferably by at least 120°, and most preferably by at least 180° is required in order to move the pushbutton from the first position into the second position or vice versa. In this embodiment, an accidental dislocation of the pushbutton from the operation position (second position) into the first position and, thereby, an accidental disassembly of the pushbutton, is unlikely or even prevented. Further, this embodiment allows for the implementation of additional elements to keep the pushbutton in the second position, such as by using one or more electronics boards, as will be described below.

In a further preferred embodiment, one of the first and second hinge elements comprises a locking element, preferably one of a bolt, a lock, a catch, or a bar. In this case, the other of the first and second hinge elements preferably comprises a clearing element, preferably one of a groove, a slot or a notch. This clearing element and the locking element interact in the first position, in order to allow for the assembly and/or disassembly of the hinge. Thus, e.g., the second hinge element may comprise and axle having a groove, wherein the first hinge element further comprises a bearing for receiving the axle, wherein the first hinge element further comprises a locking element including a locking bar, wherein the locking bar allows for
an insertion of the axle into the bearing in the first position by sliding the locking bar through the groove. Once inserted into the bearing the axle is allowed to be turned into a different position, e.g. the second position, wherein in this second position the locking element, e.g. the locking bar, is not in the position to interact with the clearing element, e.g. the groove, and, thereby, prevents a disassembly of the second and first hinge elements.

Generally, in a further preferred embodiment of the invention, at least one of the first hinge element and the second hinge element may comprise one bearing element, wherein the other of these hinge elements comprises a corresponding axle element or coupling element. Therein the axle element or the coupling element are adapted to be fitted into the bearing element, in order to form a hinge.

This "bearing" element may comprise any suitable form of receptacle suited for receiving the axle element or coupling element. Thus, the bearing element may comprise one or more concave elements, such as elements having circular or round openings, pockets or recesses, adapted for receiving the axle element or coupling element, and, allowing for the axle element or coupling element to be turned or pivoted inside this opening, pocket or recess.

The coupling or axle element on the other hand may preferably comprise one or more round elements, which are adapted for being received in the bearing element and for being turned therein, in order to provide a hinge action. Thus, the axle element or coupling element may comprise a bore-shaped element, a cylindrical axle element, a ball-shaped element or an element having the shape of a segment of a ball, or any other round element connected to the pushbutton.

Preferably, the bearing element provides at least three support points for supporting the axle element or the coupling element. The expression "support point" may include any suitable support, including support areas, for bearing and supporting the axle element or the coupling element. Thus, the support points may comprise one or more concave areas of the type described above. The redundancy of the support points increases the stability of the assembly of the apparatus and allows for a "smooth" operation of the pushbutton.

In a further preferred embodiment, the housing comprises at least one opening. This opening may, e.g., be of a round or rectangular shape. The first hinge element may be located at a distance from the opening, such as on the inside of the housing. In this case, the pushbutton preferably comprises at least one pushbutton body operable by a user, such as a pushbutton body having a round or rectangular cross section. This pushbutton body may comprise a surface facing towards the user in an assembled state of the apparatus. This sur-
face may comprise labels, legends, displays or similar visual elements, in order for a user to recognize the function of the pushbutton. Preferably, the pushbutton body is adapted to at least partially fit into the opening of the housing. The pushbutton body preferably is connected to the second hinge element by at least one connecting element, preferably one of a bar, a pole, a rod or a connecting frame. This spatial separation of the pushbutton body and the second hinge element provides for a lever action of the operation of the pushbutton.

In a further preferred embodiment, at least one of the first and second hinge elements comprises a spring element. This spring element may comprise one or more of a tong, clip or a leaf spring. The spring element is adapted to apply a force to the other of the first and second hinge elements, in order to intensify the engagement between the first and second hinge elements in an assembled state of the hinge. Thus, especially in the embodiment described above, wherein the first and second hinge elements comprise a clearing element and a locking element to prevent unwanted generation of noise during operation. Thus, e.g., the first hinge element may comprise a bearing element, and the second hinge element may comprise an axle element, wherein, in an assembled state, the spring element may be part of the first hinge element and may exert a force onto the axle element, in order to push the axle element against the bearing element.

As described above, in a further embodiment, the apparatus may further comprise at least one electronics board. This electronics board may, e.g., comprise a printed circuit board and may be adapted to support one or more of the electrical or electromechanical functions. Thus, the electronics board may comprise one or more electronics components, such as passive or active electronics components. The electronics board preferably is adapted to keep the pushbutton in a position, preferably the second position, in which the first and second hinge elements are locked, in order to prevent a disassembly. Thus, the electronics board may be located beneath the pushbutton, in order to prevent a turning of the pushbutton from the second position, preferably an operation position, into the first position, which may be the disassembly position. Thus, an unintended disassembly of the pushbutton may be prevented.

The apparatus may further comprise at least one switch element, preferably a microswitch element. The switch element may e.g. be used to initiate one or more electrical, electromechanical or mechanical actions, such as to switch on or off a microphone. The switch element may be located between the housing and the pushbutton and may be adapted to be activated when the pushbutton is pushed. Thus, by using the hinge motion as described above, the pushbutton may form a lever which is rotated around an axis of the hinge, thereby activating the switch element. The pushbutton itself may further comprise one or
more noses, projections, protrusions or stamps, which might exert a force onto the switch element. The switch element may be located on or may be part of the electronics board mentioned above.

5 Short description of preferred embodiments

Preferred embodiments of the invention are depicted in the Figures and will be explained in further detail in the following description.

10 In the Figures

Figure 1 shows a top view of the housing and the pushbutton in a disassembled state;

Figure 2 shows an assembly procedure of the housing and the pushbutton in a perspective view from the bottom side;

Figure 3 shows the pushbutton and the housing in a first position after assembly;

Figure 4 is a detailed view of the first and second hinge elements of Figure 3 in position 1;

Figure 5 shows a perspective view of an assembly of an electronics board to the housing; and

Figure 6 shows a cross-sectional side view of the apparatus in an assembled state.

Figures 1-6 are different views of one embodiment of an apparatus according to the invention in different states of assembly. In the following description, reference is made to all of these figures, and an assembly procedure according to the invention is described with reference to these figures. Nevertheless, this assembly procedure is simply one possible embodiment of an assembly procedure of an apparatus according to the invention.

In Figure 1, an apparatus 110 according to the invention is depicted in a perspective view in a disassembled state. The apparatus 110 may e.g. be used as a discussion unit or as part of a discussion unit or conference system and may comprise more elements than the elements depicted in the following figures. The apparatus may e.g. further comprise one or more loudspeakers, displays, electronics components, mechanical components or other elements. The apparatus 110 comprises a housing 112, which may be of any suitable shape and which,
in this simple embodiment, is of an essentially cuboid form. The housing 112 comprises side walls 114 and a top surface 124 having an opening 118 which may be of any suitable shape, such as of an essentially rectangular shape as shown in this simple exemplary embodiment.

The apparatus 110 further comprises a pushbutton 120, which is also depicted in a perspective top view in Figure 1. The pushbutton 120 comprises a pushbutton body 122 which, like the other components of the apparatus 110, may be formed of a plastics material, such as by using an injection moulding process. The pushbutton body 114 may comprise and operating surface 124 which may be used by a user of the apparatus 110 to apply force to the pushbutton 120, e.g. by using a finger.

The pushbutton 120 further comprises an axle element 126. The axle element 126 essentially may be of any suitable shape, such as a triangular shape or cross section, a square shape, a hexagonal shape, a generally polygonal shape or - as shown in Figure 1 - of an essentially cylindrical shape with a round cross section. This axle element 126 forms part of a second hinge element 128. The pushbutton body 120 is connected to the axle element 126 by a connecting element 130, which, in the case of the embodiment depicted in Figure 1, comprises two arms connecting the pushbutton body 122 with the axle element 126. Thus, the pushbutton body 122 is spatially separated from the axle element 126. The arms of the connecting element 130 meet the axle element 126 at a distance from the ends of the axle element 126, thus leaving studs 132 at the ends of the axle element 126. Further, as can be seen in Figure 1 and as will become clearer in view of the following figures, the axle element 126 comprises rectangular grooves 134 perpendicular to the axis of the axle element 126 and pointing towards the pushbutton body 122. These rectangular grooves 134 form clearing elements 136, the function of which will become clear with regard to the description given below.

In Figure 2, a perspective view of the apparatus 110 from the bottom side is given, showing an assembly procedure of the apparatus 110. In this figure, an inner surface 138 of the housing 112 is depicted, showing various elements of this housing 112. Thus, close to the corners of the housing 112, four cylindrical sockets 140 are shown, which comprise threaded holes 142, for mounting an electronics board, as will be explained below with reference to Figure 5.

Further, the housing 112 comprises a first hinge element 144. This first hinge element 144 comprises three bearing elements 146. Each of these bearing elements 146 provides for a concave support area 148, which is, by its diameter, adapted to receive the axle element 126 of the second hinge element 128. The bearing elements 146 essentially may be of any suit-
able cross section for receiving the axle element 126. Thus, the bearing elements 146 may be of a quadratic or rectangular shape, a triangular shape, a hexagonal shape, a generally polygonal shape or - as in the embodiment shown in Figure 2 - of an essentially round shape. It has to be mentioned that, in order to provide for a hinge operation of the hinge elements 144, 128, the axle element 126 and the bearing elements 146 not necessarily have to be of a round or circular cross section. Thus, e.g., an axle element 126 of a triangular, square or hexagonal cross section may fit into a bearing element 146 of an essentially round or circular shape and vice versa. Nevertheless, preferably, at least one of the first and second hinge elements 144, 128 comprises an element (such as the bearing elements 146 and/or the axle elements 126, respectively) of an essentially round or circular cross section or shape.

Two stopper elements 150, only one of which is shown in the perspective view in Figure 2, which are opposed to each other with regard to the axis of the bearing elements 146, are further parts of the first hinge element 144. These stopper elements 150 are adapted to keep the axle element 126 in its actual position, once this axle element 126 is inserted into the bearing elements 146.

Further, the first hinge element 144, in the embodiment shown in the figures, comprises two locking elements 152. These locking elements 152 in the embodiment shown in the figures, comprise hooks 154 having a round catching surface 156 positioned to be located above the axle element 126 once this axle element 126 is inserted into the bearing element 146. The hooks 154 comprise end faces 158, which are located approximately halfway above the axle element 126, once the axle element 126 is inserted in the bearing elements 146. The hooks 154 of the locking elements 152 are dimensioned such that these hooks 154 fit into the grooves 134 of the clearing elements 136.

Thus, in the position shown in Figure 2, which in the following is named "first position" (referential 160 in Figure 2), the pushbutton 120 may be inserted into the housing 112. The insertion is denoted by referential 162 in Figure 2. In this first position 160, the locking elements 152 and the clearing elements 136 are oriented in such a way that an insertion of the second hinge element 128 into the first hinge element 144 is possible. After the insertion 162 of the pushbutton 120 into the housing 112, the first and second hinge elements 144, 128 together form a hinge 164 (see Figure 3).

In a second step of assembly, which is depicted in Figure 3, the pushbutton 120 is turned around the axis of the hinge 164 by approximately 180°, which is indicated by referential 166 in Figure 3. Thereby, the pushbutton body 122 is turned around the hinge 164, whereby
the operating surface 124 is turned into the opening 118 of the housing 112. Thus, the operating surface 120 becomes operable from the top surface 116 of the housing 112, allowing for a user to push the pushbutton 120. This position, in which the pushbutton body 122 at least partially is inserted into the opening 118, is named the second position and is indicated by referential 168 in Figure 3.

Simultaneously, by the turning movement 166, the hinged pushbutton 120 is now protected from falling out by the locking elements 152. To better understand this locking mechanism, reference is made to the detailed view in Figure 4, still showing the pushbutton 120 in the first position 160, in which position the axle element 126 is still allowed to slide out of the bearing elements 146. In this first position 160, the grooves 134 of the clearing elements 136 are still aligned with the hooks 154 of the locking elements 152. Once the pushbutton 120 is turned around, as indicated by referential 166 in Figure 3, the grooves 134 are also turned around by approximately 120° and, therefore, are not aligned with the hooks 154 any longer. Thereby, the hooks 154 catch the axle element 126 and prevent the axle element 126 from falling out of the bearing elements 146.

Further, as specifically can be seen in the detailed view of Figure 4, the first hinge element 144 comprises spring elements 170. These spring elements 170, which, in the embodiment shown in the Figures, are located on both sides of the middle one of the bearing elements 146, are ledge-type spring elements and exert a force onto the axle element 126 once this axle element 126 is inserted into the bearing elements 146. These spring elements 170 thereby prevent the pushbutton 120 to rattle in the housing 112 in any position of the pushbutton 120.

After the turning of the pushbutton 120 into the second position 168, as indicated in Figure 3, the apparatus 110 can further be mounted in any conventional way. Thus, as shown in Figure 5, an electronics board 172, such as a printed circuit board, may be mounted onto the sockets 140. Preferably, this electronics board 172 comprises mounting holes 174 fitting the threaded holes 142 of the sockets 140. The electronics board 172 may be mounted to the sockets 140 by using screws, bolts or any other type of mounting mechanism. As can be seen in Figure 5, the electronics board 172 further holds the pushbutton 120 in the second position 168 by preventing it from turning back into the first position 160.

As further indicated in Figure 5, showing the electronics board 172 from its back side 176, and as can be seen more clearly in the sectional side view in Figure 6, showing the apparatus 110 in an assembled state, the electronics board 172 preferably comprises at least one switch element 178. The switch element 178 may be mounted by using any suitable technol...
ogy to the front side 180 of the electronics board 172. The pushbutton 120, on its back side, may comprise a stamp element 182 facing the switch element 178. Thus, by pushing the pushbutton 120, a user may activate the switch 178.

The assembly shown in Figure 6 may further be completed by adding a back-plane (not shown) to the housing 112. Further elements may be added.

Thus, the exemplary embodiment shown in the figures provides an apparatus 110 having a hinged button 120 which may be used to easily but forcefully initiate any electrical, electro-mechanical or even mechanical action of the apparatus 110. The positioning and fixation of the button 120 is simple and may be performed in a fast and cost-effective way. Still, the assembly is rather robust, since the locking elements 152 provide a robust fixation of the button 120 in the second position 168, which is used as an operating position. The use of the spring elements 170, which may e.g. comprise plastic springs, effectively avoids a rattling of the button 120.
1. Apparatus (110) for performing at least one electrical or electromechanical function, preferably a communication function, wherein the apparatus (110) comprises at least one housing (112) and at least one pushbutton (120), wherein the housing (112) comprises at least one first hinge element (144), wherein the pushbutton (120) comprises at least one second hinge element (128), wherein the first and second hinge elements (144, 128) are adapted to interact as a hinge (164) in an assembled state of the apparatus (110).

2. The apparatus (110) according to the preceding claim, wherein the first hinge element (144) and the second hinge element (128) are adapted to allow for an assembly and/or disassembly of the hinge in a first position (160) and are adapted to prevent a disassembly in at least one second position (168), wherein the at least one second position (168) differs from the first position (160), and wherein the at least one second position (168) preferably comprises an operation position of the pushbutton (120).

3. The apparatus (110) according to the preceding claim, wherein one of the first and second hinge elements (144, 128) comprises at least one locking element (152), preferably one of a bolt, a hook (154), a lock, a catch or a bar, wherein the other of the first and second hinge elements (144, 128) comprises at least one clearing element (136), preferably one of a groove (134), a slot or a notch, wherein the clearing element (136) and the locking element (152) interact in the first position (160), in order to allow for the assembly and/or disassembly of the hinge (164).

4. The apparatus (110) according to one of the two preceding claims, wherein the first position (160) and the second position (168) are located in such a way that a turning of the hinge by an angle of at least 90°, preferably at least 120° and most preferably 180° is required in order to move the pushbutton (120) from the first position (160) into the second position (168) or vice versa.

5. The apparatus (110) according to one of the preceding claims, wherein at least one of the first and second hinge elements (144, 128) comprises at least one bearing element (146) and wherein the other of the first and second hinge elements (144, 128) comprises at least one axle element (126) or at least one coupling element, wherein the axle element (126) or the coupling element is adapted to be fitted into the bearing element (146).
6. The apparatus (110) according to the preceding claim, wherein the bearing element
(146) provides at least three support areas (148) for supporting the axle element (126)
or the coupling element.

7. The apparatus (110) according to one of the preceding claims, wherein the housing
(112) comprises at least one opening (118), wherein the first hinge element (144) is lo-
cated at a distance from the opening (118), wherein the pushbutton (120) comprises at
least one pushbutton body (122) operable by a user, wherein the pushbutton body (122)
is adapted to at least partially fit into the opening (118), wherein the pushbutton body
(122) is connected to the second hinge element (128) by at least one connecting ele-
ment (130), preferably one of a bar, a pole, a rod or a connecting frame.

8. The apparatus (110) according to one of the preceding claims, wherein at least one of
the first and second hinge elements (144, 128) comprises at least one spring element
(170), preferably one of a tongue, a clip or a leaf spring, wherein the spring element
(170) is adapted to apply a force to the other of the first and second hinge elements
(144, 128), in order to intensify the engagement between the first and second hinge
elements (144, 128), preferably to prevent noise formation during operation of the
pushbutton (120).

9. The apparatus (110) according to one of the preceding claims, further comprising at
least one electronics board (172), preferably a printed circuit board, wherein the elec-
tronics board (172) is adapted to keep the pushbutton (120) in a position in which the
first and second hinge elements (144, 128) are locked in order prevent a disassembly.

10. The apparatus (110) according to one of the preceding claims, further comprising at
least one switch element (178), preferably a microswitch element, wherein the switch
element (178) is adapted to be activated when the pushbutton (120) is pushed.

11. The apparatus (110) according to one of the preceding claims, wherein the apparatus
(110) comprises a discussion unit for use in a communication system or in a conference
system.
## INTERNATIONAL SEARCH REPORT

### A. CLASSIFICATION OF SUBJECT MATTER

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### B. FIELD SEARCHED

- **Documentation**
  - HOIH

### C. DOCUMENTS CONSIDERED TO BE RELEVANT

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### D. Additional documents

- **X** special categories of cited documents -
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### Date of the actual completion of the international search

15 December 2008

### Date of mailing of the international search report

23/12/2008

### Name and mailing address of the ISA

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### Authorized officer

Nieto, Jose Miguel

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